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ABSTRACT

This curriculum guide outlines the mathematics objectives of each of the grades K-8 under the headings of operations, sentences and problem solving, numbers and numeration, measurement, geometry, statistics, and applications. Examples of each of the objectives are given. High school minimal skills are listed. The sequence of mathematics courses for grades 9-12 is listed, along with a detailed description of each course. This description includes recommended prerequisites, usual grade level, rationale, description of students for which the course is planned, course evaluation, objectives, and topical outline. (MP)

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WEST BLOOMFIELD SCHOOL DISTRICT

MATHEMATICS

CURRICULUM GUIDE, K-12

SE 027 844

SCOPE AND SEQUENCE CHART

for

MATHEMATICS

K-12

KINDERGARTEN MATH OBJECTIVES:

OPERATIONS

1. Joining sets to 10
2. Joining sets to 5

SENTENCES AND PROBLEM SOLVING

1. Determining greater than, less than
2. Completing patterns
3. Developing equality and inequality intuitively through comparisons of shapes and sizes

NUMBERS AND NUMERATION

1. Making one-to-one correspondences
2. Sorting and classifying
3. Counting through 10
4. Matching sets with appropriate number (0-10)
5. Identifying numbers to 10 orally
6. Ordering numbers 1-10
7. Identifying one-half as related to region and sets

MEASUREMENT

1. Understanding time: day, season
2. Comparing lengths and sizes
3. Ordering lengths

GEOMETRY

1. Identify basic shapes; square, rectangle, circle, triangle
2. Identifying concepts, above, below, on, etc.
3. Identifying closed curves

STATISTICS

1. Reading picture graphs
2. Identifying order of events
3. Completing patterns with shapes

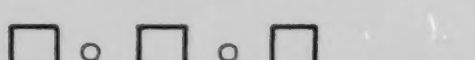
APPLICATIONS

1. Using money: penny

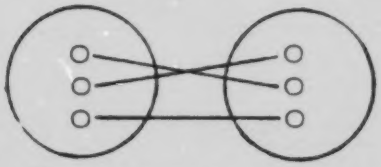
KINDERGARTEN - OPERATIONS

	Objectives	Examples
S	1. Joining sets to 10	Join a set of 2 jacks with a set of 3 jacks and identify the resulting set as a set of 5 jacks.
S	2. Separating sets to 5	Take a set of 5 jacks and separate them into 2 sets identifying the number of jacks in each.

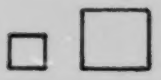
KINDERGARTEN - SENTENCES AND PROBLEM SOLVING

S	1. Determining greater than, less than	Take a set of 12. State whether that set is bigger than, or less than a set of 5 blocks.
S	2. Completing patterns	
	3. Developing equality and inequality intuitively through comparisons of shapes and sizes.	

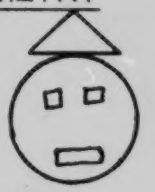
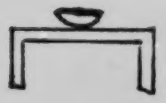
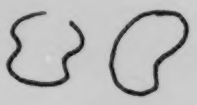
KINDERGARTEN - NUMBERS AND NUMERATION

	Objectives	Examples
S	1. Making one-to-one correspondences	
S	2. Sorting and classifying objects	Given a set of blocks and balls, sort the objects into two sets, one set of blocks, one of balls.
S	3. Counting through 10	Correctly count aloud through 10
S	4. Matching sets with appropriate number (0-10)	Correctly match a given set with the appropriate numeral.
S	5. Identifying numbers to 10 orally	Correctly name numeral when shown from flashcard.
S	6. Ordering numbers 1-10	1st, 2nd, 3rd, etc.
S	7. Identifying one-half as related to region and sets	Say, "Which one shows one-half?"

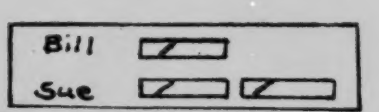
KINDERGARTEN - MEASUREMENT

	Objectives	Examples
	1. Understanding time: day, season	What day of the week is it?
S	2. Comparing lengths and sizes	 Which block is larger?
S	3. Ordering lengths	Given 4 unequal length sticks, place them in order, shortest to longest.

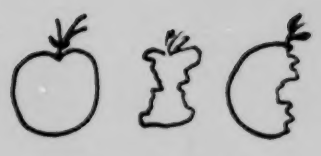
KINDERGARTEN - GEOMETRY

S	1. Identify basic shapes; square, rectangle, circle, triangle	 What shapes can you find?
	2. Identifying concepts, above, below, on, etc.	 Is the bowl above or below the table?
	3. Identifying closed curves	Which is closed? 

KINDERGARTEN - STATISTICS

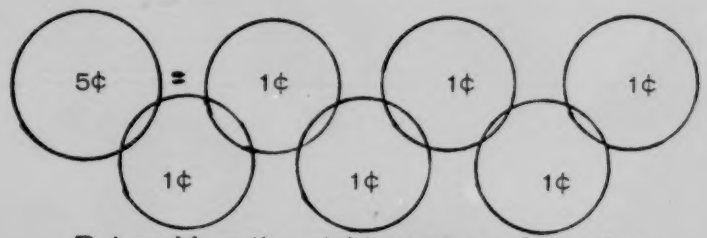
S	1. Reading picture graphs	Given this graph:  State that sue has 2 candy bars

KINDERGARTEN - STATISTICS con't.

Objectives	Examples
2. Identifying order of events	Put these in proper order: 
S 3. Completing patterns with shapes	△ △ ○ ○ △ △ ___ ___

KINDERGARTEN - APPLICATIONS

1. Using money: penny



Put an X on the right number of pennies.

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FIRST GRADE MATH OBJECTIVES

OPERATIONS

1. Knowing addition and subtraction facts to 18
2. Adding 3 addends the sum of which is less than 12

SENTENCES AND PROBLEM SOLVING

1. Writing addition and subtraction equations for:
   a. picture models
   b. oral models
   c. word models
2. Knowing family of facts for addition and subtraction

NUMBERS AND NUMERATION

1. Grouping sets by 10
2. Using symbols: +, -, =
3. Counting through 100
4. Counting by 2's first 10 multiples
5. Counting by 5's first 10 multiples
6. Using ordinal numbers
7. Using number line
8. Understanding place values 1's, 10's, 100's
9. Counting by 10's 1st 10 multiples

MEASUREMENT

1. Understanding time: Hour, half-hour, calendar
2. Understanding metric units:
3. Understanding English units: inch, pint
4. Comparing temperatures: hot and cold, hotter and colder
5. Using non-standard units of measurement

GEOMETRY

1. Matching words: rectangle, square, circle, and triangle with appropriate shapes

STATISICS

1. Completing picture graphs
2. Reading bar graphs
3. Recording data

APPLICATIONS

1. Using money: penny, nickel, dime

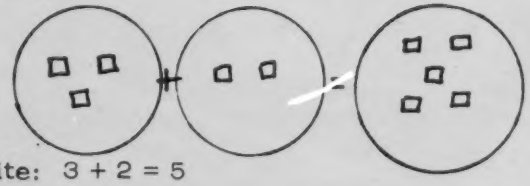
FIRST GRADE - OPERATIONS

	Objectives	Examples
S	1. Knowing addition and subtraction facts to 18	8 + 3 = ☐
S	2. Adding 3 addends the sum of which is less than 12	4 + 3 + 2 = ☐

FIRST GRADE - SENTENCES AND PROBLEM SOLVING

S 1. Writing addition and subtraction equations for:
   a. picture models
   b. oral models
   c. word models

Picture model:



Child should write: 3 + 2 = 5

2. Knowing family of facts for addition and subtraction

Given numbers 2, 5 and 7, child should write:

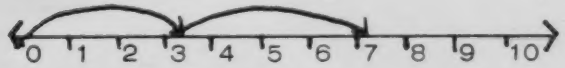
2 + 5 = 7 7 - 5 = 2
5 + 2 = 7 7 - 2 = 5

FIRST GRADE - NUMBERS AND NUMERATION

1. Grouping sets by 10

Given a set of 24 counting chips, separate the chips into 2 groups of 10, with another set of 4.

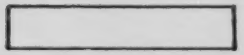
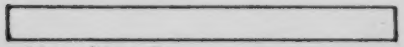
FIRST GRADE - NUMBERS AND NUMERATION con't.

	Objectives	Examples
S	2. Using symbols: +, −, =	2 △ 3 = 5
S	3. Counting through 100	
S	4. Counting by 2's, first 10 multiples	
S	5. Counting by 5's, first 10 multiples	
S	6. Using ordinal numbers	Given a row of 5 cars, child can identify the third car.
S	7. Using number line	
S	8. Understanding place values 1's, 10's, 100's	243 = 200 + □ + 3
S	9. Counting by 10's, 1st 10 multiples	

FIRST GRADE - MEASUREMENT

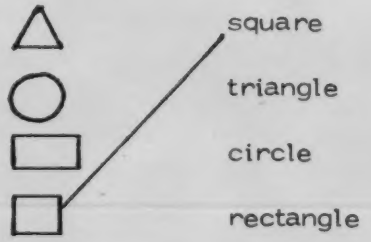
S	1. Understanding time: hour, half-hour, calendar	What time is it?
	2. Understanding metric unit:	How many centimeters long?

FIRST GRADE - MEASUREMENT con't.

Objectives	Examples
S 3. Understanding English units: inch, pint	 How many inches long?
4. Comparing temperatures: hot and cold; hotter and colder	Given 2 liquids, child can determine with thermometer which is hotter.
S 5. Using non-standard units of measurement	 How many paper clips long?

FIRST GRADE - GEOMETRY

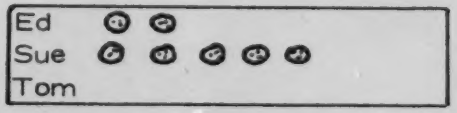
S 1. Matching words: rectangle, square, circle and triangle with appropriate shapes



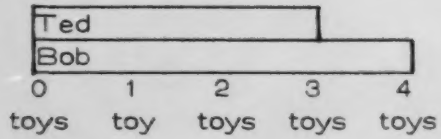
FIRST GRADE - STATISTICS

S 1. Completing picture graphs

Tom ate 4 cookies. Complete this graph.



FIRST GRADE - STATISTICS con't.

	Objectives	Examples
S	2. Reading bar graphs	Given this graph:  Tell how many toys each boy received.
S	3. Recording data	Given a list of names, ask each person what his favorite color is and record the answer next to the name.

Diane Nelson Louis	
Name	Color

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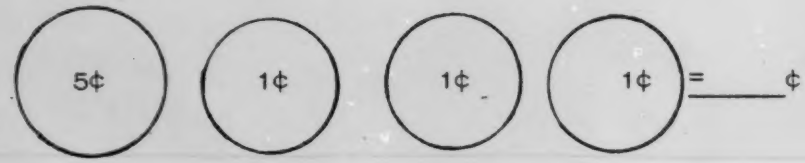
FIRST GRADE - APPLICATIONS

S 1. Using money: penny, nickel, dime



SECOND GRADE MATH OBJECTIVES

OPERATIONS

1. Adding two-digit addends with renaming
2. Subtracting two-digit numbers with renaming
3. Knowing multiplication facts less than 4 x 5

SENTENCES AND PROBLEM SOLVING

1. Finding missing addends for sums less than 10
2. Writing multiplication equations from models, (also division)
3. Finding missing operation sign: add, subtract, multiply

NUMBERS AND NUMERATION

1. Counting through 1,000
2. Counting by 3's through 30
3. Ordering through 20
4. Identifying portions of regions and sets as: 1/2, 1/3, 1/4, 3/4, 2/3
5. Differentiating between odd and even numbers
6. Using expanded notation for three-digit numbers
7. Regrouping of two-digit numbers

MEASUREMENT

1. Using units: Time: quarter-hour, minutes, months, years
2. Using Metric unit: liter
3. Using English unit: foot, gallon
4. Understanding temperature: Celsius
5. Measuring sides of polygons
6. Counting equal units on a path

GEOMETRY

1. Identifying sides and corners
2. Understanding symmetry
3. Using coordinate geometry; streets and blocks

PROBABILITY AND STATISTICS

1. Completing bar graphs
2. Making probability

APPLICATION

1. Finding shortest path on grid of streets and blocks
2. Earning and spending money
3. Counting money

SECOND GRADE - OPERATIONS

	Objectives	Examples
S	1. Adding two-digit addends with renaming	44 + 28
S	2. Subtracting two-digit numbers with renaming	53 - 15
S	3. Knowing multiplication facts less than 4 x 5	

SECOND GRADE - SENTENCES AND PROBLEM SOLVING

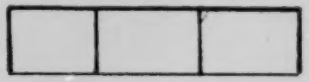
S	1. Finding missing addends for sums less than 10	3 + ___ = 9
S	2. Writing multiplication equations from models, (also division)	Write a multiplication sentence:
	3. Finding missing operation sign: add, subtract, multiply	32 ___ 5 = 37

SECOND GRADE - NUMBERS AND NUMERATION

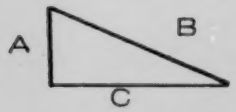
S 1. Counting through 1,000

S 2. Counting by 3's through 30

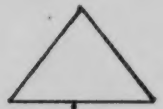
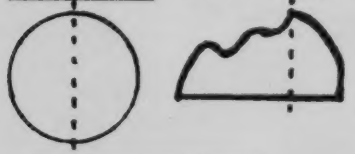
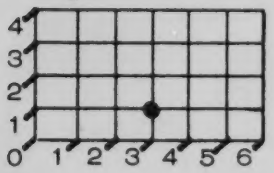
SECOND GRADE - NUMBERS AND NUMERATION

	Objectives	Examples
S	3. Ordering through 20	Given a line of 18 students, identify the 13th student.
S	4. Identifying portions of regions and sets as: 1/2, 1/3, 1/4, 3/4, 2/3	How much of this region is shaded? 
	5. Differentiating between odd and even numbers	Odd or even? O O / O O O
S	6. Using expanded notation for three-digit numbers	328 = 300 + 20 + 8
S	7. Regrouping of two-digit numbers	74 = 60 + (14)

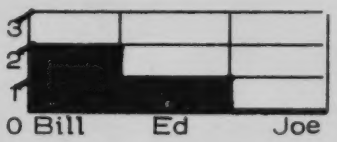
SECOND GRADE - MEASUREMENT

S	1. Using units: Time: quarter-hour, minutes, months, years	Given a calendar, tell month, day, date and year.
	2. Using Metric unit: liter	Compare a liter with a quart; tell which is more.
S	3. Using English unit: foot, gallon	How many pints in a quart? In a gallon?
S	4. Understanding temperature: Celsius	Given a Celsius thermometer, child will read temperature.
S	5. Measuring sides of polygons	 How many centimeters long is each side?
S	6. Counting equal units on a path	How many units from O is P?

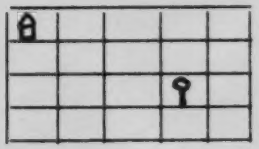
SECOND GRADE - GEOMETRY

	Objectives	Examples
	1. Identifying sides and corners	 Put a little circle on the 3 corners.
S	2. Understanding symmetry	 Which figure has symmetry?
	3. Using coordinate geometry; streets and blocks	 Locate (3, 1) on this grid.

SECOND GRADE - PROBABILITY AND STATISTICS

S	1. Completing bar graphs	 Complete this graph if Joe has 3 marbles.
	2. Making probability conclusions	If a hat contains 12 red and 2 green marbles, and a blindfolded person picks one marble, what color will it probably be?

SECOND GRADE - APPLICATION

Objectives	Examples
1. Finding shortest path on grid of streets and blocks	 How many blocks from the house to the stop sign?
S 2. Earning and spending money	Mary earned 60¢. She spent 25¢ on gum. How much money does she have left?
S 3. Counting money	Given a set of various coins, the child will determine the total amount.

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THIRD GRADE MATH OBJECTIVES:

OPERATIONS

1. Adding three-digit addends with renaming (carrying)
2. Subtracting three-digit numerals with renaming (borrowing)
3. Checking addition and subtraction
4. Adding of like fractions where sums are less than 1 and the denominators less than 4
5. Knowing multiolication facts through 10 x 10
6. Multiplying with 0 or 1 as a factor
7. Multiplying with multiples of 10 or 100 as one factor
8. Multiplying two-digit numerals by one-digit numerals
9. Multiplying three-digit numerals by one-digit numerals
10. Knowing division facts through 100 ÷ 10
11. Using o as a dividend
12. Dividing with one-digit divisor, three-digit dividend and remainder

SENTENCES AND PROBLEM SOLVING

1. Finding missing factor in multiplication facts
2. Knowing family of facts for multiplication and division

NUMBERS AND NUMERATION

1. Counting by 4's through 40
2. Understanding place value: thousands
3. Reading four-digit numbers
4. Comparing fractions using models
5. Identifying fractions equal to one
6. Regrouping three-digit numbers
7. Recognizing Roman numerals: I, V, X, L, C, D, M

MEASUREMENT

1. Using time unit: seconds
2. Understanding inaccuracy of non-standard units of measure
3. Using metric units; meter
4. Using English units: half-inch, yard
5. Computing perimeters
6. Counting square units (area)
7. Computing volume: counting cubic units
8. Exploring sensibility of answers
9. Using equivalent measures: cups, pints, quarts and gallons

GEOMETRY

1. Identifying pentagon, hexagon, octogon
2. Identifying: rays, angles, right angles, radius, diameter, cube, diangle,perimeter

PROBABILITY AND STATISTICS

1. Making bar graphs

APPLICATIONS

1. Solving word plroblems about height, age, weight, transportation. sports, science, etc.
2. Adding and subtracting money

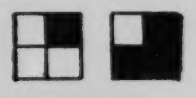
THIRD GRADE - OPERATIONS

	Objectives	Examples
S	1. Adding three-digit addends with renaming (carrying)	379 + 864 = _____
S	2. Subtracting three-digit numerals with renaming (borrowing)	827 - 219 = _____
S	3. Checking addition and subtraction	28 + 15 = 43, so 43 - 15 should equal 28
S	4. Adding of like fractions where sums are less than 1 and the denominators less than 4	1/4 + 2/4 = ☐
S	5. Knowing multiplication facts through 10 x 10	9 x 7 = ☐
S	6. Multiplying with 0 or 1 as a factor	0 x 7 = ☐
S	7. Multiplying with multiples of 10 or 100 as one factor	9 x 100 = ____
S	8. Multiplying two-digit numerals by one-digit numerals	22 x 4 = ____
S	9. Multiplying three-digit numerals by one-digit numerals	146 x 3 = ____
S	10. Knowing division facts through 100 ÷ 10	48 ÷ 6 = ____
S	11. Using 0 as a dividend	0 ÷ 9 = ____
S	12. Dividing with one-digit divisor, three-digit dividend and remainder	$6\overline{)257}$ 42 r5

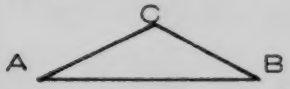
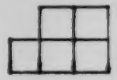
THIRD GRADE - SENTENCES AND PROBLEM SOLVING

	Objectives	Examples
S	1. Finding missing factor in multiplication facts	$2 \times \square = 8$
S	2. Knowing family of facts for multiplication and division	$6 \times 8 = 48$, so $48 \div 6 = \square$

THIRD GRADE - NUMBERS AND NUMERATION

	1. Counting by 4's through 40	
S	2. Understanding place value: thousands	In 6,421, which numeral is in the thousands place?
S	3. Reading four-digit numbers	Read this number: 4,206
S	4. Comparing fractions using models	 Which picture shows a larger fraction?
S	5. Identifying fractions equal to one	Which fraction equals 1? 2/3, 4/4, 1/2
S	6. Regrouping three-digit numbers	426 = 300 + (126)
S	7. Recognizing Roman numerals: I, V, X, L, C, D, M	Write the Roman Numeral for: 50, for 1,000

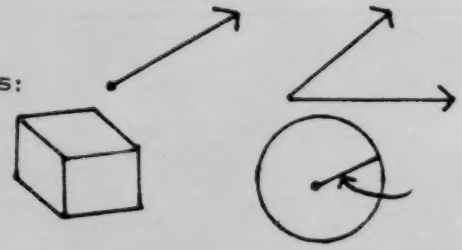
THIRD GRADE - MEASUREMENT

	Objectives	Examples
S	1. Using time unit: seconds	How many seconds in a minute?
	2. Understanding inaccuracy of non-standard units of measure	Have 2 children compare how many "fingernails" long their math books are.
S	3. Using metric units: meter	If 100 cm = 1m, how many cm equal 6 m?
S	4. Using English units: half-inch, yard	Cut a piece of string 3 1/2 inches long
S	5. Computing perimeters	 Measure the distance around this triangle
S	6. Counting square units (area)	1 sq. unit □ ____ sq. units? 
S	7. Computing volume: counting cubic units	Using blocks, make a model of 10 sq. units
	8. Exploring sensibility of answers	Can 516 x 83 = 513?
	9. Using equivalent measures: cups, pints, quarts and gallons	How many cups in a pint?

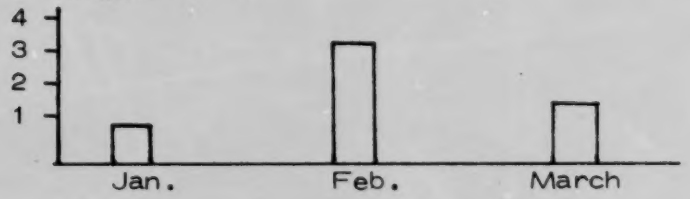
THIRD GRADE - GEOMETRY

	Objectives	Examples
	1. Identifying pentagon, hexagon, octagon	Which is an octagon?

THIRD GRADE - GEOMETRY con't.

	Objectives	Examples
S	2. Identifying: rays, angles, right angles, radius, diameter, cube, diagonal, perimeter	Name these figures: 

THIRD GRADE - PROBABILITY AND STATISTICS

S	1. Making bar graphs	Make a bar graph to show how many classmates were born in each month of the year. 

THIRD GRADE - APPLICATIONS

	Objectives	Examples
	1. Solving word problems about height, age, weight, transportation, sports, science, etc.	John's weight last year was 75 lbs. Now he weighs 86 lbs. How much did he gain?
S	2. Adding and subtracting money	Joe saved $2.28. He spent $1.50. How much is left?

FOURTH GRADE MATH OBJECTIVES:

OPERATIONS

1. Adding with three or more renamings (up to 5 addends)
2. Find missing addend
3. Subtracting four-digit numerals with renamings
4. Relating subtraction to addition
5. Adding or subtracting two-digit numerals mentally without renaming
6. Giving multiples of one-digit numerals
7. Multiplying by multiples of 10 ans 100
8. Multiplying with a two-digit multiplier
9. Estimating two-number multiplication
10. Multiplying mentally one-digit by two-digit
11. Multiplying by 10, 100, 1,000
12. Dividing two-digit divisors with a resulting two-digit quotient with remainder
13. Being able to check multiplication and division problems
14. Subtracting fractions without like denominators

SENTENCES AND PROBLEM SOLVING

1. Finding the missing whole number term in a proportion where the known ratio is in the lowest terms
2. Using the symbol $\neq$

NUMBERS AND NUMERATION

1. Knowing place value through 100 millions
2. rounding to the nearest 10 and 100
3. Using Roman numerals less than 50
4. Recognizing prime numbers less than 16
5. Comparing fractions with denominators less than 8
6. Writing mixed fractions on the number line
7. Writing improper fractions on the number line
8. Reading decimals to the 10th and 100th

MEASUREMENT

1. Knowing metric units: kilometer, gram, kilogram
2. Using English units
3. Understanding temperature in Farenheit and Celsius
4. Using formulas for perimeter

GEOMETRY

1. Identify: polygons, regular polygons, quadrilaterals, parallelograms, point, end point, line, parallel lines, intersecting lines
2. Constructiong: cirlce designs, bisecting line, segments

STATISTICS

1. Finding averages
2. Recording data

APPLICATION

1. Solving money problems using appropriate dollars and cent symbols
2. Solving consumer problems using dollars and cents

FOURTH GRADE - OPERATIONS

	Objectives	Examples
AR-II-A-26*	1. Adding with three or more renamings (up to 5 addends)	539 + 83 + 655 = _____
	2. Find missing addend	N + 28 = 75
AR-II-B-20**	3. Subtracting four-digit numerals with renamings	1,024 - 946 = _____
AR-II-B10	4. Relating subtraction to addition	Given that 9 + 6 = 15, child should be able to give that 15 - 9 = 6, and that 15 - 6 = 9
	5. Adding or subtracting two-digit numerals mentally without renaming	Without pencil or paper, find 83 - 51
AR-I-B-84 AR-I-B-85	6. Giving multiples of one digit numerals	7, 14, 21, 28, ...
AR-II-C-12 AR-II-C-13 AR-II-C-20 AR-II-C-24	7. Multiplying by multiples of 10 and 100	172 x20
AR-II-C-23	8. Multiplying with a two-digit multiplier	429 x63
AR-II-C-21 AR-II-C-22	9. Estimating two-number multiplication	Which answer is closest to being correct? 116 x 5 = 200, 500, 900
	10. Multiplying mentally one-digit by two-digit	Without pencil or paper, find 72 x 5
AR-II-C-12	11. Multiplying by 10, 100, 1,000	43 x 1,000 = _____

*M.E.A.P. requires only up to 3 addends
**M.E.A.P. requires subtraction from only as large as a three-digit number

FOURTH GRADE - OPERATIONS con't.

	Objectives	Examples
AR-II-D-19	12. Dividing two-digit divisors with a resulting two-digit quotient with remainder	$21\overline{)5,382}$
AR-II-D-7	13. Being able to check multiplication and division problems	$27 \div 3 = 9$, does $3 \times 9 = 27$?
AR-III-C-7* AR-III-C-10 AR-III-C-11 AR-III-C-12	14. Subtracting fractions without like denominators	$\frac{2}{3} - \frac{1}{2} = \square$

FOURTH GRADE - SENTENCES AND PROBLEM SOLVING

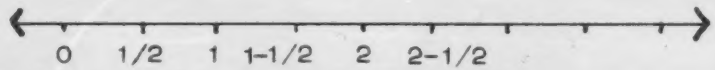
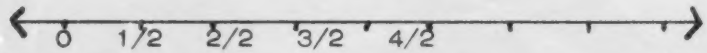
AR-III-A-22**	1. Finding the missing whole number term in a proportion where the known ratio is in the lowest terms	$\frac{2}{3} = \frac{x}{9}$, find x
AL-3	2. Using the symbol $\neq$	$1/5 \neq 15$

FOURTH GRADE - NUMBERS AND NUMERATION

AR-I-B-90***	1. Knowing place value through 100 millions	What numeral is in the ten-millions place? 125,634,708
AR-II-A-23	2. Rounding to the nearest 10 and 100	Round 47 to the nearest ten

*Only M.E.A.P. objective #AR-III-C-7 is required in grades 4-6
**Not required by M.E.A.P. until grades 7-9
***M.E.A.P. requires only up to thousandth place

FOURTH GRADE - NUMBERS AND NUMERATION con't.

	Objectives	Examples
AR-I-B-92	3. Using Roman numerals less than 50	Write your answer in Roman numerals: VI + XX = _____
	4. Recognizing prime numbers less than 16	Circle the primes: 2,3,4,5,6,7,8,9,10,11, 12,13,14,15,16
AR-III-A-24	5. Comparing fractions with denominators less than 8	Use > or < , 2/3 ___ 3/4
	6. Writing mixed numbers on the number line	 Finish labelling the number line
	7. Writing improper fractions on the number line	 Finish labelling the number line
AR-IV-A-1	8. Reading decimals to the 10th and 100th	Read this number: .07

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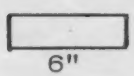
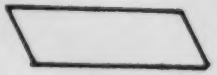
FOURTH GRADE - MEASUREMENT

M-I-A-25 M-II-D-5 M-II-D-6 M-II-D-7	1. Knowing metric units: kilometer, gram, kilogram	73 km = ___ m
	2. Using English units:	Lake Superior is about 350 _____ long. (choose miles, ounces, pounds, tons)
M-II-C-3 M-II-C-4 M-II-C-5	3. Understanding temperature in Farenheit and Celsius	Linda is swimming on a lake. Its temperature is 90^{o} ____ and 18^{o} ____. (Use Celsius and Farenheit.
	4. Using formulas for perimeter	 Perimeter = (2x6)+ (2x2)

FOURTH GRADE - GEOMETRY

	Objectives	Examples
G-I-A-4*	1. Identifying: a. polygons b. regular polygons c. quadrilaterals d. parallelograms e. point f. end point g. line h. parallel lines i. intersecting lines	Which is the parallelogram? A B C 
G-II-3	2. Constructing: circle designs, bisecting line, segments	Bisect this segment: _____

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FOURTH GRADE - STATISTICS

P-21**	1. Finding averages	Find the average age of a group of students with these ages: 13, 11, 12, 11, 14, 11
P-2 P-3 P-6	2. Recording data	Complete this chart with the appropriate information Average number of hours spent watching T.V. daily Bob Ed Sue Alice

*Several figures need not be identified until grades 7-9 according to the M.E.A.P.

**Not required by M.E.A.P. until grades 7-9

FOURTH GRADE - APPLICATION

	Objectives	Examples
M-II-B-6 M-II-B-7 M-II-B-8 M-II-B-9	1. Solving money problems using appropriate dollars and cent symbols	$12.83 + $2.26 = _____
	2. Solving consumer problems using dollars and cents	How much money does Mr. Jones owe if he takes out 3 loans for $120.50 each?

FIFTH GRADE MATH OBJECTIVES:

OPERATIONS

1. Estimating sums of two or three numerals by rounding addends to one significant digit
2. Finding the least common multiples of two numbers less than 10
3. Using three-digit multiplication
4. Finding missing factor
5. Writing quotient as a mixed number
6. Adding three fractions with unlike denominators less than 16
7. Subtracting fractions with unlike denominators less than 16
8. Adding three mixed numerals with the same denominator
9. Adding three mixed numerals with unlike denominator less than 16
10. Subtracting mixed numbers with or without regrouping and denominator less than 16
11. Multiplying of decimals with 10th, 100th, 1,000th
12. Adding decimals using 100th and 1,000th
13. Multiplying decimals by 10, 100, 1000
14. Multiplying fractions with ine digit denominators
15. Multiplying fractions by whole numbers

SENTENCES AND PROBLEM SOLVING

1. Solving sentences with a missing factor
2. Using formulas for area, volume and perimeter

NUMBERS AND NUMERATION

1. Using parentheses
2. Writing and reading decimals to the 1,000th place
3. Comparing and orderind decimals to thousandths
4. Changing fractions with denominators of 10 and 100 to decimals
5. Changing decimals to fractions with denominator of 10 and 100
6. Ordering fractions with denominator less than 18
7. Finding equal fractions with denominators less than 30, where one numerator is a multiple of the other
8. Reducing fractions to lowest terms with denominators less than 50
9. Changing improper fractions to mixed numbers with denominators less than 12 and numerators less than 100
10. Changing mixed numbers to improper fractions with whole numbers less than 25 and denominator less than 12
11. Writing fractions with denominators of 100 as percents
12. Using divisibilty rules for 3, 3, 5, 9, 10
13. Using factor trees to find prime factorizations of numbers less than 100
14. Finding the least common multiple and the greatest common factor by listing

MEASUREMENT

1. Using metric units: millimeter, milliliter, cm^3, m^3
2. Using English units: 1/8 inch, cubic inch, cubic, foot, cubic yard
3. Finding area of rectangles and triangles
4. Measuring angles
5. Finding volume: rectangular prisms
6. Measuring line segments to nearest ½ inch or nearest centimeter

FIFTH GRADE MATH OBJECTIVES (CON):

GEOMETRY

1. Identifying perpendicular lines
2. Knowing the sum of angles of a triangle
3. identifying congruent angles
4. Identifying prisms, pyramids, cylinders, cones and spheres
5. Identifying faces, vertices and edges of prisms and pyramids
6. Identifying similar figures
7. Making constructions: line designs, drawing angles, (Using protractor, compass and straightedge)

PROBABILITY AND STATISTICS

1. Making line graphs

APPLICATIONS

1. Using maps and scale drawings
2. Solving word problems using metric units
3. Solving problems using rate, time and distance

FIFTH GRADE - OPERATIONS

	Objectives	Examples
S	1. Estimating sums of two or three numerals by rounding addends to one significant digit	Estimate: 321 +283 → 300 +300
S	2. Finding the least common multiples of two numbers less than 10	What is the LCM of 8 and 6?
S	3. Using three digit multiplication	327 x 142 = _____
S	4. Finding missing factor	72 x _____ = 576
S	5. Writing quotient as a mixed number	$3\overline{)70}$ → 23 1/3
	6. Adding three fractions with unlike denominators less than 16	1/2 + 2/5 + 1/6 = _____
S	7. Subtracting fractions with unlike denominators less than 16	5/9 - 1/3 = _____
	8. Adding three mixed numerals with the same denominator	2 1/7 + 1 3/7 + 4 1/7 = _____
	9. Adding three mixed numerals with unlike denominator less than 16	5 1/4 + 2 1/7 + 1 2/3 = _____
S	10. Subtracting mixed numbers with or without regrouping and denominator less than 16	10 2/5 - 8 2/3 = _____
S	11. Multiplying of decimals with 10th, 100th, 1000th	.5 x .317 = _____

FIFTH GRADE - OPERATIONS con't.

	Objectives	Examples
S	12. Adding decimals using 100th and 1000th	.51 + .07 = _____
S	13. Multiplying decimals by 10, 100, 1000	.76 x 1000 = _____
S	14. Multiplying fractions with one digit denominators	2/5 x 1/7 = _____
S	15. Multiplying fractions by whole numbers	9 x 3/4 = _____
S	16. Multiplying mixed numbers with one digit denominators	2 1/3 x 5 2/5 = _____

FIFTH GRADE - SENTENCES AND PROBLEM SOLVING

S	1. Solving sentences with a missing factor	33 x ___ = 693
S	2. Using formulas for area, volume and perimeter	8cm 10cm Find the area of this rectangle in square centim

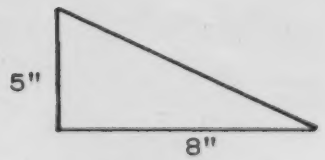
FIFTH GRADE - NUMBERS AND NUMERATION

	Objectives	Examples
	1. Using parentheses	$83 \div (2 \times 20) =$ _____
S	2. Writing and reading decimals to the 1000th place	Write as a decimal: $\frac{216}{1000}$
S	3. Comparing and ordering decimals to thousandths	Put in order, smallest to largest: .132 .1022 .1232
S	4. Changing fractions with denominators of 10 and 100 to decimals	Write as a decimal: $\frac{29}{100}$
S	5. Changing decimals to fractions with denominator of 10 and 100	Write as a fraction: .61
S	6. Ordering fractions with denominator less than 18	Put in order from smallest to largest: 1/7, 2/15, 3/16, 1/8
S	7. Finding equal fractions with denominators less than 30, where one numerator is a multiple of the other	$\frac{3}{7} = \frac{x}{21}$
S	8. Reducing fractions to lowest terms with denominators less than 50	Reduce to lowest terms: $\frac{26}{48}$
S	9. Changing improper fractions to mixed numbers with denominators less than 12 and numerators less than 100	Change to mixed fraction: $\frac{96}{13}$
S	10. Changing mixed numbers to improper fractions with whole numbers less than 25 and denominator less than 12	Change to improper fraction: $\frac{240}{11}$

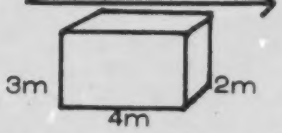
FIFTH GRADE - NUMBERS AND NUMERATION con't.

	Objectives	Examples
S	11. Writing fractions with denominators of 100 as percents	Write as a percent: $\frac{17}{100}$
	12. Using divisibility rules for 2, 3, 5, 9, 10	Is 2516 divisible by 3? By 10?
	13. Using factor trees to find prime factorizations of numbers less than 100	Make a complete factor tree for 36
	14. Finding the least common multiple and the greatest common factor by listing	Find the greatest common factor of 12 and 18. Factors of 12: 1, 2, 3, 4, 6, 12 Factors of 18: 1, 2, 3, 6, 9, 18 GCF is 6

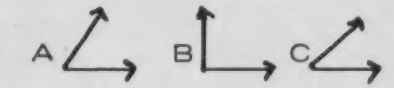
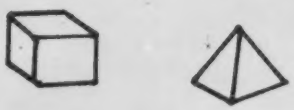
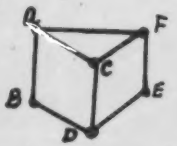
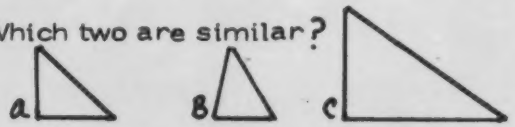
FIFTH GRADE - MEASUREMENT

S	1. Using metric units: millimeter, milliliter, cm^3, m^3	How many millileters make one liter?
S	2. Using English units: 1/8 inch, cubic inch cubic foot cubic yard	Measure this segment to the nearest 1/8 inch: _____
S	3. Finding area of rectangles and triangles	 find the area

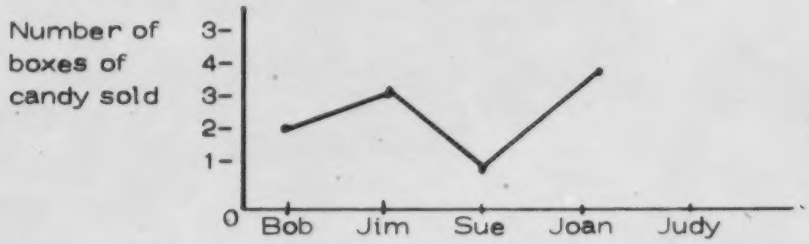
FIFTH - GRADE MEASUREMENT con't.

	Objectives	Examples
S	4. Measuring angles	Using a protractor, find the measure of this angle
	5. Finding volume: rectangular prisms	 Find the volume
S	6. Measuring line segments to nearest 1/2 inch or nearest centimeter	Measure to the nearest centimeter

FIFTH GRADE - GEOMETRY

S	1. Identifying perpendicular lines	Are these lines perpendicular?
	2. Knowing the sum of angles of a triangle	
	3. Identifying congruent angles	Which two are congruent 
S	4. Identifying prisms, pyramids, cylinders, cones and spheres	Which is a prism? 
	5. Identifying faces, vertices and edges of prisms and pyramids	Is $\overline{AB}$ a face, vertice, or edge? 
	6. Identifying similar figures	Which two are similar? 
	7. Making constructions: line designs drawing angles (Using protractor, compass and straightedge)	Draw a 25° angle using a protractor and straightedge.

FIFTH GRADE - PROBABILITY AND STATISTICS

Objectives	Examples
1. Making line graphs	Complete this line graph. If Judy sold 3 boxes: 

FIFTH GRADE - APPLICATIONS

	Objectives	Examples
S	1. Using maps and scale drawings	Given a map and a scale (1 inch=1 mile) find the distance between two locations on the map.
S	2. Solving word problems using metric units	If a car travels 80km per hour, how far will it travel in 7 hours?
	3. Solving problems using rate, time and distance	If Mr. Jones has exactly 13 hours to drive 1107 miles, how fast must he travel, on the average?

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SIXTH GRADE MATH OBJECTIVES:

OPERATIONS

1. Dividing with three digit divisors
2. Dividing with zeros in the quotient
3. Dividing a decimal number by a whole number
4. Dividing a decimal number by a decimal number up to 1,000ths
5. Dividing decimals by 10, 100, 1,000
6. Dividing a fraction by: a fraction, whole number and mixed numeral
7. Dividing a mixed number
8. Multiplying fractions using cancellation
9. Finding a percent of a number
10. Finding the least common denominator
11. Finding powers of whole numbers
12. Adding and subtracting integers between 10 and -10

SENTENCES AND PROBLEM SOLVING

1. Using formilae for circumferences
2. Solving percent problems with ratio and proportion
3. Using flow charts

NUMBERS AND NUMERATION

1. Rounding a decimal number
2. Finding cross products for pairs of fractions to see if they are equivalent
3. Converting a fraction to a terminating decimal number where the denominator is less than 12
4. Converting a fraction to a repeating decimal number where the denom- is less than 12
5. Finding the missing term of a proportion by cross-multiplication
6. Converting a fraction to a percent where the denominator is less than 12
7. Comparing positive and negative numbers
8. Identifying multiples of 2, 3, 5, 7 which are less than 100
9. Identifying prime numbers and composite numbers less than 100
10. Factoring numbers less than 100
11. Converting decimal numbers to fractions with reducing
12. Naming the set of countinr numbers
13 Determining the prime factors of a number and writing in ezpontial form
14. Finding LCM and GCF by factoring
15 Giving the reciprocals of whole numbers, fractions and mixed numbers

MEASUREMENT

1. Knowing the number name for the metric prefixes, milli-through-kilo
2. Measuring line segments to the nearest mm
3. Converting between metric units by moving the decimals
4. Calculating circumference, given radius on diameter

GEOMETRY

1. Identifying regular polyhedron
2. Copying an angle by construction
3. Bisecting an angle by construction

APPLICATIONS

1. Finding discount and selling price

SIXTH GRADE MATH OBJECTIVES (CON):

APPLICATIONS (con)

2. Finding percent of discount
3. Making scale drawings
4. Conducting metric investigations

SIXTH GRADE - OPERATIONS

	Objectives	Examples
S	1. Dividing with three digit divisors	12,347 ÷ 142
S	2. Dividing with zeros in the quotient	1024 ÷ 25 = 40 r24
S	3. Dividing a decimal number by a whole number	3.42 ÷ 4
S	4. Dividing a decimal number by a decimal number, up to 1000ths	7.146 ÷ .036
S	5. Dividing decimals by 10, 100, 1000	47.03 ÷ 100
	6. Dividing a fraction by: a fraction, whole number and mixed numeral	3/5 ÷ 4 1/2
	7. Dividing a mixed number	3 2/3 ÷ 7/8
	8. Multiplying fractions using cancellation	$4/9 \times 3/2 = \frac{{}^{1}\cancel{4}}{{}_{3}\cancel{9}} \times \frac{\cancel{3}^{1}}{\cancel{2}_{1}} = \frac{1}{9}$
S	9. Finding a percent of a number	What is 12% of 82?
	10. Finding the least common denominator	What is the LCD of 2 fractions with denominators of 12 and 18?
	11. Finding powers of whole numbers	$7^3 =$ ___
	12. Adding and subtracting integers between 10 and -10	(-5) - (-3) = ___

SIXTH GRADE - SENTENCES AND PROBLEM SOLVING

	Objectives	Examples
	1. Using formulae for circumferences	$C = 2\pi$, $C = d\pi$
	2. Solving percent problems with ratio and proportion	$\frac{32}{60} = \frac{x}{100}$
	3. Using flow charts	(Refer to appropriate textbook or other material)

SIXTH GRADE - NUMBERS AND NUMERATION

S	1. Rounding a decimal number	Round 1.623 to the nearest hundredth
	2. Finding cross products for pairs of fractions to see if they are equivalent	$\frac{2}{3} \neq \frac{5}{7}$ (2x7 = 14) (3x5 = 15)
S	3. Converting a fraction to a terminating decimal by division where the denominator is less than 12	$\frac{1}{8}$, $8\overline{)1.000}$ .125
S	4. Converting a fraction to a repeating decimal number where the denominator is less than 12	$\frac{2}{3}$, $3\overline{)2.0}$ .6
	5. Finding the missing term of a proportion by cross-multiplication	$\frac{3}{7} = \frac{x}{15}$
S	6. Converting a fraction to a percent where the denominator is less than 12	$\frac{2}{5} =$ ____%
	7. Comparing positive and negative numbers	$-3 < 1$

SIXTH GRADE - NUMBER AND NUMERATIONS con't.

	Objectives	Examples
S	8. Identifying multiples of 2,3,5,7 which are less than 100	Is 81 a multiple of 5?
	9. Identifying prime numbers and composite numbers less than 100	Circle the primes: 40, 41, 42, 43, 44, 45, 46, 47, 48, 49
S	10. Factoring numbers less than 100	50 = 2x25, 10x5, 1x50
	11. Converting decimal numbers to fractions, with reducing	$1.25 = 1\ \frac{25}{100} = 1\ \frac{1}{4}$
	12. Naming the set of counting numbers	
	13. Determining the prime factors of a number and writing in exponential form	$100 = 2x2x5x5 = 2^2 \times 5^2$
	14. Finding LCM and GCF by factoring	Factors of 8 - 1,2,4,8 GCF = 4 Factors of 4 - 1,2,4 LCM = 8
	15. Giving the reciprocals of whole numbers, fractions and mixed numbers	What is the reciprocal of $\frac{2}{3}$?

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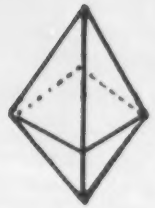
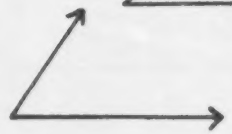
SIXTH GRADE - MEASUREMENT

S	1. Knowing the number name for the metric prefixes, milli-through-kilo	Which means centi? a) 1/100 b) 1/10 c) 100
S	2. Measuring line segments to the nearest mm	_____ Measure to the nearest mm
	3. Converting between metric units by moving the decimals	300 mm = ____cm
	4. Calculating circumference, given radius or diameter	Find the circumference

SIXTH GRADE - GEOMETRY

Objectives	Examples
1. Identifying regular polyhedron	Identify this polyhedron 
2. Copying an angle by construction	Copy this angle using a compass and a straightedge
3. Bisecting an angle by construction	Bisect this angle using a compass and a straightedge 

SIXTH GRADE - APPLICATIONS

1. Finding discount and selling price	If a $12.00 shirt is sold at 15% discount, what is the selling price?
2. Finding percent of discount	If a $12.00 shirt goes on sale for $9.00, what is the percent of discount?
3. Making scale drawings	(Refer to appropriate textbook or other materials)
4. Conducting metric investigations	Weigh numerous common objects on a metric scale

SEVENTH GRADE MATH OBJECTIVES:

OPERATIONS

1. Using the order of arithmetic operations
2. Simplifying expressions using two operations
3. Adding and subtraction integers between 20 and -20
4. Multiplying and dividing integers
5. Calculating powers of fractions
6. Multiplying and dividing decimal numbers by powers of ten
7. Finding what percent one number is of another

SENTENCES AND PROBLEM SOLVING

1. Using transformations for solving equations
2. Writing open sentences from story problems

NUMBERS AND NUMERATION

1. Using approximation symbols
2. Using the didisbility rule for 6
3. Memorizing equivalent percents for multiples of 1/10, 1/4 , 1/3
4. Giving the roster of the set of natural numbers
5. Giving the roster of the set of whole numbers
6. Giving the roster of the set of integers
7. Converting numbers greater than one to scientific notation

MEASUREMENT

1. Computing areas of parallelograms, trapezoids, circles
2. Computing the volumes of cylinders
3. Converting metric units by moving the decimal point

GEOMETRY

1. Constructing a perpendicular to a line from a point not on the line
2. Determining the supplement of a known angle
3. Determining the complement of a known angle
4. Being able to identify from a diagram: vertical angles, supplementary angles, complementary angles, alternate angles, corresponding angles

PROBABILTY

1. Finding mode
2. Finding Median
3. Finding the range of a set of numbers
4. Making circle graphs
5. Locating points in the coordinate plane

APPLICATIONS

1. Computing percent of change
2. Finding simple interest
3. Computing sales tax

SEVENTH GRADE - OPERATIONS

	Objectives	Examples
	1. Using the order of arithmetic operations	What operation do you perform first? $3 \times 7 + 4$
	2. Simplifying expressions using two operations	$(2 \times 11) + 9 =$ ___
AR-V-2	* 3. Adding and subtracting integers between 20 and -20	$18 - (-12) =$ ___
	4. Multiplying and dividing integers	$(-121) \div (-11) =$ ___
	5. Calculating powers of fractions	$(\frac{1}{5})^3 =$ ___
AR-IV-C-8	6. Multiplying and dividing decimal numbers by powers of ten	$4.52 \times 1{,}000 =$ ____
	7. Finding what percent one number is of another	What percent of 260 is 65?

SEVENTH GRADE - SENTENCES AND PROBLEM SOLVING

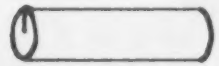
AL-11 AL-13	1. Using transformations for solving equations	$X + 12 = 50 - 12$, $X = 26$
AL-23	2. Writing open sentences from story problems	John runs a certain number of miles daily. After 30 days, John has run 90 miles.

*M.E.A.P. does not require subtraction of integers

SEVENTH GRADE - NUMBERS AND NUMERATION

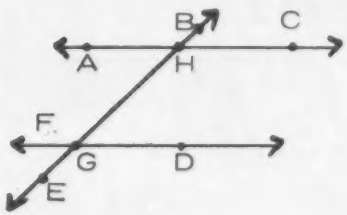
	Objectives	Examples
	1. Using approximation symbols	$\pi \approx \frac{22}{7}$
	2. Using the divisibility rule for 6	Is 212 divisible by 6?
	3. Memorizing equivalent percents for multiples of 1/10, 1/4, 1/3	$\frac{1}{10}$ = 10%, $\frac{1}{4}$= 25%, etc.
	4. Giving the roster of the set of natural numbers	1,2,3 . . .
	5. Giving the roster of the set of whole numbers	0,1,2,3 . . .
	6. Giving the roster of the set of integers	. . .-2, -1, 0, 1, 2 . . .
	7. Converting numbers greater than one to scientific notation	Write in scientific notation: 5,160.

SEVENTH GRADE - MEASUREMENT

M-I-B-15 *	1. Computing areas of parallelograms, trapezoids, circles	Find the area: r = 2"
	2. Computing the volumes of cylinders	 Find the volume if r=4cm and the length is 10cm
M-I-A-30 I-A0	3. Converting metric units by moving the decimal point	843.2cm = ____dm

* Circles only

SEVENTH GRADE - GEOMETRY

Objective	Examples
1. Constructing a perpendicular to a line from a point not on the line	A . Construct a perpendicular to the line through the point A.
2. Determining the supplement of a known angle	If m ∠ABC is 52°, and ∠XYZ is its supplement, what is the measure of ∠HIJ?
3. Determining the complement of a known anble	If m ∠ DEF is 64° and ∠HIJ is its complement, what is the measure of ∠HIJ?
4. Being able to identify from a diagram: a. vertical angles b. supplementary angles c. complementary angles d. alternate interior angles e. corresponding angles	 If $\overleftrightarrow{FD} \parallel \overleftrightarrow{AC}$, state the relationship between ∠FGE and ∠AHG

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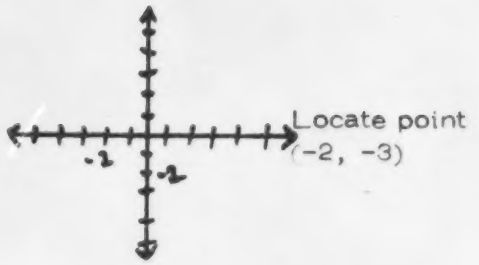
SEVENTH GRADE - PROBABILITY

1. Finding mode	Find the mode of these numbers: 12, 18, 12, 13, 13, 12, 16
1-22 2. Finding median	Find the median of these numbers: 30, 56, 28, 51, 52
3. Finding the range of a set of numbers	Find the range of these numbers: {4, 10, 3, 7, 18, 9}
4. Making circle graphs	Make a circle graph showing the way Ted spends his allowance (15% on comics, 30% on food, 50% on entertainment, 5% on misc.)

SEVENTH GRADE - PROBABILITY con't.

	Objectives	Examples
AL-28	5. Locating points in the coordinate plane	 Locate point (-2, -3)

SEVENTH GRADE - APPLICATIONS

	1. Computing percent of change	Ed 120 lbs. He now weighs 175 lbs. What was the percent of change?
AR-VI-37	2. Finding simple interest	How much interest is earned on $500 deposited for one year at 6% simple interest?
AR-VI-37	3. Computing sales tax	If the Michigan sales tax is 4%, how much tax is charged on a purchase of $26.00?

EIGHTH GRADE MATH OBJECTIVES:

OPERATIONS

1. Using percent formula with any one of three unknowns

SENTENCES AND PROBLEM SOLVING

1. Solving equations involving more than one operation

NUMBERS AND NUMERATION

1. Identifying the set of real numbers
2. Defining the universal set
3. Defining the complement of a set
4. Using the divisibility rules for 4 and 8
5. Memorizing equivalent percent formultiples of 1/20, 1/6, 1/8
6. Estimating square roots of whole numbers up to 400
7. Being able to use the square root table
8. Knowing the definition of absolute value of a number
9. Giving the reciprocal of a rational number
10. Giving the additive inverse of a rational number

MEASUREMENT

1. Measuring the dimensions of rectangular regions and computing area in metric units
2. Adding unlike metric units
3. Converting square metric units
4. Finding any missing side of a right triangle

GEOMETRY

1. Finding the missing sides from one or two similar figures when the others are unknown
2. Visulazing:
   - planes
   - space
   - skew lines
   - rays

PROBABILITY AND STATISTICS

1. Making decisions based on probabilities

APPLICATIONS

1. Computing commission and rate of commission
2. Calculating phone bills, car payments, house payments, take-home pay
3. Writing checks, keeping records
4. Buying stocks and related mathematics
5. Finding ratios for quantities in two different units of measure

EIGHTH GRADE - OPERATIONS

Objectives	Examples
1. Using percent formula with any one of three unknowns	$\frac{12}{15} = ____\%$

EIGHTH GRADE - SENTENCES AND PROBLEM SOLVING

1. Solving equations involving more than one operation	$3a + 4 = 16$

EIGHTH GRADE - NUMBERS AND NUMERATION

1. Identifying the set of real numbers	Which are real numbers: a) $\sqrt{15}$ c) π b) 17 d) $\sqrt{-1}$
2. Defining the universal set	$U = \{0, 1, 2, 4, 5\}$
3. Defining the complement of a set	$A = \{0, 2, 4\}$ $A^1 = \{1, 3, 5\}$ (see example 2 for U)
4. Using the divisibility rules for 4 and 8	Is 3,216 divisible by 4? by 8?
5. Memorizing equivalent percent for multiples of 1/20, 1/6, 1/8	$\frac{1}{6} = ___\%$, $\frac{3}{8} = ___\%$
6. Estimating square roots of whole numbers up to 400	The square root of 250 is between which two whole numbers?
7. Being able to use the square root table	(refer to appropriate table)
8. Knowing the definition of absolute value value of a number	$\lvert -21 \rvert = ___$

EIGHTH GRADE - NUMBERS AND NUMERATION con't.

Objectives	Examples
9. Giving the reciprocal of a rational number	What is the reciprocal of 3.21?
10. Giving the additive inverse of a rational number	What is the opposite of (-2/3)?

EIGHTH GRADE - MEASUREMENT

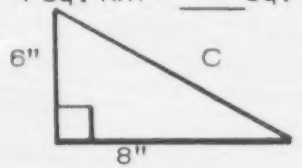
S 1. Measuring the dimensions of rectangular regions and computing area in metric units

Find the area enclosed by this rectangle

2. Adding unlike metric units — 12 cm + 5 dm = ____

3. Converting square metric units — 4 sq. km = ____ sq. m

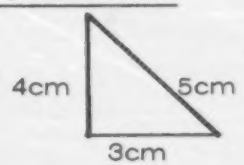
4. Finding any missing side of a right triangle

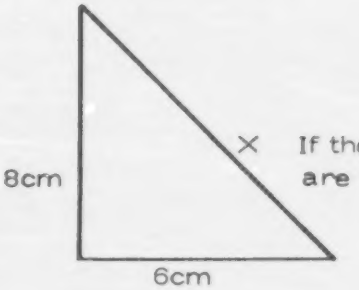


Find C without measuring

EIGHTH GRADE - GEOMETRY

1. Finding the missing sides from one or two similar figures when the others are unknown





If these 2 figures are similar, find X

2. Visualizing:
   - planes
   - space
   - skew lines
   - rays

Use examples in the classroom, such as 2 blackboard pointers, to illustrate skew lines

EIGHTH GRADE - PROBABILITY AND STATISTICS

	Objectives	Examples
S	1. Making decisions based on probabilities	On the average, 9 days in June are rainy days. Is it likely to rain on any given day in June?

EIGHTH GRADE - APPLICATIONS

	1. Computing commission and rate of commission	Rate of commission: 15%. Sales $500. What is the commission?
	2. Calculating phone bills, car payments, house payments, take-home pay	
	3. Writing checks, keeping records	
	4. Buying stocks and related mathematics	
	5. Finding ratios for quantities in two different units of measure	Write this ratio in simplist form: 2 quarts to 18 tablespoons.

HIGH SCHOOL

MINIMAL SKILLS

and

COURSE DESCRIPTIONS

HIGH SCHOOL MINIMAL SKILLS

It is hoped that all students, upon graduation, will have acquired these minimal mathematical skills.

1. Be able to use order operations

   $=, <, >, \neq$, for whole numbers.

2. Be able to compute with whole numbers, fractions and decimals using the fundamental operations of addition, subtraction, multiplication and division.

3. Be able to solve simple problems involving decimals and percents and be able to change from one form to the other.

4. Be able to solve an equation with one variable.

5. Be able to read and use graphs and tables.

6. Be able to solve basic problems involving ratios and proportions.

7. Be able to determine the appropriate mathematical operations necessary to solve simple arithmetic problems.

8. Be able to use common measuring tools such as a ruler and protractor.

9. Given the formulas and the appropriate measurements, be able to compute the areas and perimeters of common geometric figures, such as square, rectangle, triangle and circle.

10. Given the formulas and appropriate measurements, be able to compute the volume of common geometric solids such as the cube and other rectangular solids.

11. Be able to use common metric measure.

12. Be able to give change.

SEQUENCE OF MATHEMATICS COURSES
West Bloomfield High School

Course	Recommended Prerequisite	Usual Grade Level Underlined	Course Description
Alternative Mathematics A & B	None	9	An individualized, elementary course for students with special problems. Operations with whole numbers, fractions and decimals are stressed.
General Mathematics A & B	None	9, 10, 11, 12	A comprehensive study of the four basic arithmetic operations and formulas for practical daily math computation.
Introductory Algebra IA & IB	None	9, 10, 11	First semester of a four-semester course covering the usual material of a one-year algebra course.
Introductory Algebra IIA and IIB	Introductory Algebra I	10, 11	Continues the instruction begun in Introductory Algebra I.
Algebra IA and IB	Successful mathematics background	9, 10, 11, 12	Study of various number systems. Includes solving equations.
Applied Geometry A and B	Intro. Algebra I and II or Algebra I	10, 11, 12	A geometry experience intended for students who wish to take Geometry on a practical level.
Plane Geometry A and B	Algebra I or Intro. Alg. II	9, 10, 11, 12	Study of formal geometric proofs and develop concept of deductive reasoning.
Introductory Algebra IIIA and IIIB	Intro. Algebra II and Applied Geometry	11, 12	A continuation of introductory algebra covering many topics ordinarily studied in a second-year algebra course.
Algebra IIA and IIB	Algebra I and Plane Geometry	10, 11, 12	An advanced mathematics course that continues Algebra I. Develops concepts needed for work in higher mathematics, chemistry, physics and other mathematics-related courses.
Plane Trigonometry A	Algebra II or Intro. Algebra III	11, 12	Study of logarithms, circular functions, trigonometric identitiesand related topics.
Special Topics in Algebra B	Algebra II or Intro. Algebra III	11, 12	Advanced course which includes the binomial theorem, proof by induction, vector analysis, limit theorems and polynomial graphing.
Introduction to Calculus A and B	Trigonometry A and Special Topics in Algebra B	12	An elementary calculus course containing substantial amounts of differential and integral calculus

RECOMMENDATIONS

for the

FUTURE

RECOMMENDATIONS FOR THE FUTURE

- Revise the correlation with the Michigan Minimal Performance Objectives when the new state objectives are published. (1979)

- Develop and administer during the sixth semester, a math competency examination. Lack of competency should result in student referral for additional math instruction.

- Survey existing instructional materials to determine the further needs for implementation of the proposed changes of the math curriculum.

PREFACE TO ALL HIGH SCHOOL MATH OBJECTIVES

In order for any learning to occur in a public school the following conditions are necessary:

A. Adequate physical health of the student.

B. Adequate mental health of the student.

C. The student must have adequate basic socialization.

D. Good home environment.

E. Good school environment.

F. Adequate student intellectual capacity.

G. Adequate teaching.

H. Adequate instructional supplies and equipment.

If any one of the above necessary conditions is missing or defective then what follows in the subsequent pages will function poorly. Any remedy must first locate the missing or defective parts above and then remediate them.

Course Title: General Math Text: Various

Credit: ½ credit per semester Usual grade level: 9th

Approximate number of tests and/or quizzes per semester: 15

Term paper required: No

Final Exam: 10-20% of the final grade, at discretion of teacher

Pre-Requisites:

Rationale:

General Math as its name implies should instruct and re-enforce a student's arithmetic capabilities to understand and effectively calculate, by means of formulae, problems which have immediate personal and commercial importance to the student. For this reason, a structured presentation of arithmetic principles should not be the proximate objective of the teacher. Rather, practical application of fundamental processes should be the vehicle through which basic arithmetic would be exposed to the students.

Necessarily, this type of course would lend itself to exposing the student to many texts and workbooks. Basic requirements presented to the student at the beginning of the course would inform the student of course requirements and eventual credit. The various texts, geared to various reading levels, though similar in content, would serve to augment and re-enforce those areas where the student feels he needs additional work for the mastery of the process being studied.

The instructor should have a topical outline and related exercises available for the student and himself to which he can direct the student for further endeavor if the student hopes to assimilate the subject matter he is currently studying. Individual student initiative should sustain his thrusts into diverse mathematical areas.

Description of Students for Which the Course is Planned:

General Math is a terminal course. The cross-section represented is extremely varied from the standpoint of intellectual acuity, individual interest, and individual physical and emotional composition. This extreme diversity should disp l the notion of determining universal criteria for topical mastering by students in class. Rather fundamentals, disguised by topical description with subsequent hoped for individual initiative should allow students to exhaust the topics to their individual ability levels. The practical rather than speculative should be stressed during lesson presentation.

A very close working situation should exist between counselor, school psychologist, and class teacher.

Course Evaluation:

For final evaluation a grade scale can be synthesized on the basis of work completed and test results. Objective criteria in a General Math course are not practical. Stress should be placed on individual accomplishment.

Most frequent methods of instruction generally used:

Lecture method and sampling of subject matter initially is used. Eventually, usage of any and all aids to help the student understand the lesson will be used. Subsequently, teachers should strive to direct students who need re-enforcing to other texts and stimulate them sufficiently to get them to initiate effort to work additional lessons to guarantee individual assimilation of course topics.

The calculator, games, practical situations and films, if available, should be used to help foster interest and effectuate mastery.

Objectives of General Math:

I. General Objectives

Since General Math is a terminal course, our objective is to stress the mastery of the fundamental processes for immediate utilitarian social purposes.

Our stress is primarily consumer orientated. Mensuration for construction purposes and the distance formula are a prime consideration. Finally, the mechanics of the equation and how these principles are applied to solving formulae are a most important concern of the course. Immediate practical utilization of subject matter underline every introduction of subject matter.

II. Content and Knowledge Skills: The student should be able to:

A. Perform the fundamental processes (addition, subt., mult., div.,) with whole numbers.

B. Perform fundamental processes with fractions.

C. Recognize equivalent fractions.

D. Place fractions in ratio form.

E. Demonstrate proportionality.

F. Perform the fundamental processes with decimals.

G. Change decimals into percent.

H. Change percent into decimal form.

I. Find the % of a given number.

J. Solve simple geometric formulas.

K. Solve simple algebraic equations.

L. Apply mathematics to consumer income and spending.

M. Apply mathematics to managing money.

N. Apply mathematics to business and industry.

O. Find misc. applications of mathematics.

General Math Topical Outline:

I. Operations with Whole Numbers

II. Fractions

A. Equivalent fractions and their operations

B. Fractional relationships between numbers.

III. Decimal Numeration of Fractions

A. Operations with decimals

B. Decimal relationships between numbers.

IV. Percent

A. Relationship between percent, decimal fractions, and common fractions

B. Computations involving percent

V. Algebra

A. Language of algebra

1. Formulas

2. Introduction to equations

VI. Applications of Mathematics

A. Consumer income

B. Consumer spending

C. Managing Money

D. Application in Business

E. Application in Industry

F. Misc. Applications

Course Title: Introductory Algebra IA

Text: Modern Algebra Step by Step Book 1, Introductory Algebra IB

Author: Stein

Credit: ½ credit per semester Usual grade level: 9th

Approximate number of tests and/or quizzes: 10 per semester

Term paper required: No

Final Exam: 10-20% of final grade, at discretion of teacher

Pre-Requisites:

Special Projects: At the discretion of the teacher

Rationale:

This course is the beginning of a two year program covering first year contemporary algebra. It is designed to include some of the background material leading to algebra and covers some of the basic algebraic concepts. Students have a chance to work at a slower pace in order to better understand and master many of the basic concepts.

Description of students for which the course is designed:

Students who have gained a proficiency in general math, but who would find the demands of the traditional first year algebra course too rigorous would benefit from this course. Students may continue on into Introductory Algebra II in order to complete the topics of a first year algebra course.

Course Evaluation:

The effectiveness of this course will be measured as follows:

A. 70% of the student who finish the course should meet the course objectives to the teacher's satisfaction.

B. The teacher will use his own tests and personal observations of the students as the evaluation.

Most frequent methods of instruction used in this course:

Lecture, discussion and problem solving. Verbal problems provided by the text, give opportunities to apply the understanding and learned skills to real life problem situations.

Course Objectives:

I. Content and knowledge skills: During the process of this course the student will be able to:

A. Identify the define basic algebraic terms, symbols, sets and properties.

B. Factor positive whole numbers.

C. Perform various simple operations on sets.

D. Have a basic understanding of the concept of absolute value and opposites.

E. Solve arithmetic problems involving positive and negative numbers.

F. Identify and write numerical and algebraic expressions and simple formulaes.

G. Evaluate algebraic expressions and formulaes.

H. Perform basic operations with different types of polynomials.

I. Solve and graph simple equations in one variable.

J. Solve and graph simple inqualities in one variable.

II. Application skills

A. Students will be exposed to various types of problems that apply the mathematical concepts learned in practical situations.

Complete Course Outline:

I. Numbers, Operations, Properties and Sets

A. Numbers and sets

1. Graphs on a number line

B. Operations and properties

C. Number Theory

1. Factors

2. Prime/composite numbers

3. GCF/LCM

D. Operations with sets

1. Venn Diagrams

II. Positive and Negative Numbers

A. Extensions of the number system

B. Vectors

C. Operations with positive and negative numbers

III. Mathematical Expressions, Sentences, Equations, Inequalities and Formulaes

A. Expressions, sentences, formulae

B. Evaluations of expressions, sentences, formulae

IV. Operations with Polynomials

A. Additions, subtraction, multiplication and division of monomials and polynomials

B. Simple laws of exponents

C. Math expressions involving parentheses

V. Equations in One Variable

A. Properties of equality

B. Solutions of basic equations

1. Use of inverse operations

2. Use of two or more operations

C. Solutions involving restricted replacement sets

D. Graphs of equations in one variable

E. Problems

VI. Inequalities in One Variable

A. Solutions of simple inequalities

1. Use of inverse operations

2. Use of two or more operations

B. Graphing inequalities in one variable

Course Title: Algebra IA and Algebra IB

Text: Modern Algebra Structure and Method - Book 1
(Revised Edition)

Authors: Dolciani, Wooton Credit: ½ per semester

Usual grade level: 9th

Approximate number of tests and/or quizzes: 10 per semester

Term paper required: No

Final Exam: 10-20% of final grade at the discretion of the teacher

Pre-Requisites:

Special Projects: At the discretion of the teacher

Rationale:

The above course is designed to help the student understand some of the basic structures of algebra (the real number system), recognize the techniques of algebra as reflections of this structure, acquire facility in applying algebraic concepts and skills, perceive the role of deductive reasoning in algebra and to appreciate the need for precision of language.

Description of students for which the course is planned in general:

Students who have an aptitude for mathematics, and who are capable of progress at a rapid pace set the course. These students are expected to continue with the study of mathematics at High School Level.

Course Evaluation:

The effectiveness of this course will be measured as follows:

1. 70% of the students who take the course should meet the course objectives to the teacher's satisfaction.

2. The teacher will use his own tests and personal observations of the student as the evaluation.

Most frequent methods of instruction generally used in this course:

Lecture, discussion, problem solving, and introduction of models to illustrate the concept studied when deemed necessary.

Students are guided in discovering mathematical principles and are given the opportunity to strengthen the comprehensive study of these principles by the variety of exercises available. Verbal problems provided by the text, give opportunities to apply the understanding and learned skills to real life problem situations.

Objectives of the course:

I. Content and Knowledge skills

A. Understanding order of numbers on the number line.

B. Being able to understand the idea of a set and a subset.

C. Being familiar with symbols of inclusion as means to indicate the order of operation.

D. Being able to operate with positive and negative numbers (to add, subtract, multiply and divide.)

E. Being able to add and subtract polynomials.

F. Being able to find the product of powers and the power of a product; to multiply polynomials and to solve simple problems.

G. To be able to find the quotient of powers and to divide polynomials.

H. Being able to factor simple algebraic expressions.

I. To be able to add, subtract, multiply and divide algebraic fractions.

J. To be able to graph a linear equation, determine the slope of a line, and write an equation of a line.

K. Being able to graph inequalities.

L. To be able to solve simultaneous equations.

M. To be able to add, subtract, multiply and divide radicals.

N. Being able to solve quadratic equations.

II. Application skills

A. Being able to use the skills of operations with directed numbers in forming and solving equations, in inequalities, and in problem solving.

B. Being able to set up problems in the real number system.

C. Being able to analyze and solve simple word problems.

D. Being an aid in reading graphs in science courses.

III. Skills of Synthesis

Being able to apply the skills learned in this course to problem solving.

Course Outline:

I. Numbers and sets

A. Numbers and Numerals

1. Naming numbers, equality and inequality sign

2. Punctuation marks in Algebra

B. Numbers and Points

1. Graphing and comparing coordinates on the number line

2. Graphing on the number line

3. Comparing coordinates on the number line

C. Sets of Numbers

1. Membership in a set

2. Kinds of sets

3. Graphs of sets

II. Language of Algebra

A. Variables and Mathematical Expressions

1. Evaluating simple algebraic expressions

2. Factors, coefficients and exponents

3. Order of operations

B. Open Sentences

1. Solving simple open sentences

2. Identifying basic algebraic expressions as being true or false

3. Setting up simple word problems

III. Addition and Multiplication of Real Numbers

A. Identifying and using the basic number axioms

1. Axioms of equality

2. Closure properties

3. Commutative and Associative properties

4. Distributive properties

5. Absolute value

B. Transforming Equations with Equality Properties

1. Addition and Subtraction properties of equality

2. Division and Multiplication properties of equality

3. Combining terms using transformation properties

IV. Solving Equations and problems

A. Transforming equations using addition, subtraction, multiplication, and division

1. Combining transformation in one problem

B. Using equations to solve problems

1. Method of setting up equations from written problem

2. Solving simple equations with variables in both members

C. Equations and Functions

1. Domain and range

2. Function symbols

V. Solving inequalities

A. Solving inequalities using transformation

B. Combining inequalities

1. Intersection and union of sets

2. Intersection and union of inequalities

C. Solving simple problems

1. Setting up equations for simple story problems

2. Solving simple problems using transformation methods

VI. Working with Plynomials

A. Addition/Subtraction of Polynomials

1. Terminology

2. Adding Polynomials

3. Subtracting Polynomials

B. Multiplication of Polynomials

1. Rule of exponents for multiplication, powers

2. Multiplying polynomials by monomial

3. Multiplying polynomial by polynomial

4. Raising polynomials to powers

C. Division of Polynonials

1. Rule of exponents for division

2. Dividing polynonial by mononial

3. Dividing polynomial by polynomial

VII. Special products and factoring

A. Distributive axiom in factoring

1. Factoring in the set of rational numbers

2. Factoring out monomial factors

B. Factoring Binomials and Trinomials

1. Special cases

2. Multiplying and squaring binomials

3. Combining several types of factoring

C. Using factoring in solving equations

VIII. Operations with fractions

A. Fractions and ratios

1. Recognizing algebraic fractions

2. Reducing algebraic fractions

3. Ratio

4. Percent

B. Multiplying and Dividing fractions

C. Adding and Subtracting fractions

1. Operations on fractions with equal denominators

2. Operations on fractions with unequal denominators

3. Mixed expressions

IX. Using fractions

A. Simple equations and inequalities that have fractional coefficients

B. Fractional equations

C. Setting up simple word problems involving fractions

Course Title: Introductory Algebra 2A

Text: Modern Algebra Step by Step (Second Book), Introductory Algebra 2B

Author: Stein Term paper required: No

Approximate number of tests: Five tests or quizzes per marking period

Credit: ½ per semester Usual grade level: 10th

Final Exam: 10-20% of final grade, at discretion of teacher

Pre-Requisites:

Special projects: None

Rationale:

This course is the concluding part of a two-year program covering first-year contemporary algebra and it is designed to include the topics generally studied in the second-half of first-year algebra; thus allowing students a chance to work at a slower pace in order to better understand and master many of the basic concepts. These students hopefully experience success that perhaps was never possible in the faster-paced traditional first-year contemporary algebra course.

Objectives:

A. Content and Knowledge Skills: During the process of this course the student will be able to:

1. Graph equations and inequalities in two variables on the real number plane by the slope-intercept method.

2. Find the product of any two binomials and factor polynomials.

3. Simplify rational algebraic expressions using rational operations.

4. Solve sentences with rational algebraic expressions consisting of equations with fractional coefficients, fractional and decimal equations.

5. Solve systems of linear equations in two variables graphically and algebraically.

6. Solve systems of linear inequalities graphically.

7. Simplify radicals, operate with radicals and solve radical equations.

8. Solve quadratic equations by factoring, completing the square and the quadratic formula.

B. Application Skills:

1. Students will develop an appreciation for the applications of various mathematical skills utilized in occupations ranging from nuclear physicists to domestic engineers, as they also realize mathematical concepts touch base with both the vocational and avocational aspects of their lives.

Description of Students:

Students who have gained proficiency in general math, but who would find the demands of the traditional first-year algebra course too rigorous would profit most from this course; after they have passed the first course (Introductory Algebra I) in this program.

Course Evaluation:

If 70% of the students who take this course meet the course objectives to the instructor's satisfaction, the effectiveness will have been established. Teachers will use their own tests as well as their personal observations of their students in this evaluation.

Complete Course Outline:

I. Sets and Number systems

II. Operations and Properties

III. Equations and Inequalities in One Variable

IV. Coordinate Geometry

A. Graphing an equation in two variables

1. Ordered number pairs

2. Points on a number plane

3. Solution set of an equation in two variables

4. Graphing an equation in two variables on real number plane

5. Slope of a line and the y-intercept

6. Graphing a linear euqation in two variables by slope-intercept method

B. Graphing an inequality in two variables

1. Graphing an inequality in two variables on the real number plane

V. Special Products and Factoring

A. Special Products

1. Product of two binomials

2. Squaring a monomial

3. Squaring a binomial

B. Factoring

1. Factors

2. Factoring polynomials having a common monomial factor

3. Square root of a monomial

4. Factoring the difference of two squares

5. Factoring a perfect square trinomial

6. Factoring trinomials of second degree - general method

7. Complete Factoring

8. Applications - Special Products and Factoring

VI. Operations with Rational Algebraic Expressions

A. Operations

1. Simplifying rational algebraic expressions

2. Multiplication of rational algebraic expressions

3. Division of rational algebraic expressions

4. Addition and subtraction of rational algebraic expressions

5. Multiples; least common denominator

6. Complex fractions

VII. Sentences with Rational Expressions

A. Equations with Rational Expressions

1. Equations with fractional coefficients

2. Fractional equations

3. Equations with decimal fractions

B. Formulas and Problems

1. Evaluation of formulas

2. Problems (Optional)

VIII. Systems of Sentences in Two Variables

A. Systems of linear equations in two variables

1. Solving systems of linear equations in two variables by graphing

2. Solving systems of linear equations in two variables by addition

3. Solving systems of linear equations in two variables by substitution

4. Miscellaneous systems of linear equations

B. Systems of Linear Inequalities in two Variables

1. Solving a system of linear inequalities in two variables by graphing

IX. Powers; Roots; Radicals

A. Powers

1. Power of a power

B. Roots and Radicals

1. Rational numbers; inrrational numbers; real numbers

2. Square Root

3. Roots of monomials

4. Rational Exponents

5. Simplifications of radicals

6. Addition and subtraction of radicals

7. Multiplication and division of radicals

8. Radical equations

X. Quadratic Equations

A. Equations

1. Solving incomplete quadratic equations

2. Solving quadratic equations by factoring

3. Solving quadratic equations by completing the square

4. Solving quadratic equations by formula

B. Formulas and Problems

1. Evaluation of formulas

2. Problems (Optional)

Course Title: Integrated Geometry (Plane and Solid)

Text: School Mathametics Geometry Authors: Anderson, Garon Gremillion

Credit: ½ credit per semester Usual Grade Level: 10th

Approximate number of tests per semester: 10 tests and/or quizzes

Term paper required: No

Final Exam: 10-20% of final grade, at discretion of teacher

Special Projects: At the discretion of the teacher

Pre-Requisites:

Rationale:

The above course is designed to help the student to understand the basic structure of geometry. Develop powers of spatial visualization while building his knowledge of the relationships among geometric elements. Grow in understanding of the deductive method and in appreciation of the need for precision of language. Use and strengthen his algebraic skills. Experience the stimulation and satisfaction that comes from clear and sometimes creative thinking.

Description of students for which the course is planned in general:

This course is designed to accommodate students who have an aptitude for methematics, and who are capable of progress at a rapid pace set by the course.

Many topics of the course are essential, and form a sound foundation for further study of mathematics.

Course Objectives:

The effectiveness of the course will be measured as follows:

1. 70% of the students who complete the course should meet the course objectives to the teacher's satisfaction.

2. The teachers will use their own tests and observations of the students as the final evaluation.

Most frequent methods of instruction generally used in teaching this course:

Lecture, discussion, demonstration of proofs on black board. Demonstration by means of drawings, diagrams and models when necessary.

Objectives of the Course:

I. Content and Knowledge Skills

1. To become acquainted with the nature of geometry and organized logical development of geometry.

2. Be able to understand the idea of sets and real numbers.

3. Be able to understand concept of distance.

4. To learn and to understand conepts of line, plane and separation.

5. To understand concepts of angles, and triangles and to learn precise definitions.

6. To have basic idea and understanding of congruence.

7. To understand the basic idea of Deductive Reasoning.

8. To learn and to understand the Fundamental Inequality Theorems.

9. Learning and understanding of the definitions and basic theorems of perpendicular lines and planes in space.

10. Learning and understanding of the basic definitions and theorems of parallel lines in a plane.

11. To learn basic concepts and methods of finding areas of polygonal regions.

12. Understanding of concepts of similarity.

13. Learning of the initial definitions and theorems about circles and spheres.

14. To acquire basic skills and knowledge in concurrency and construction.

15. To learn about measures relating to circles.

16. To learn basic concepts and methods of finding volumes of solids.

II. Application Skills

1. To be able to measure angles using protractor.

2. To be able to apply definitions, postulates, and theorems to demonstrate simple two column proofs.

3. To be able to do basic construction using compass and straightedge.

4. To be able to analyze given information and to apply the acquired knowledge to problem solving: finding areas of plane figures and volumes of solids.

III. Skills and Synthesis

After completing this course students are expected to be able to apply the acquired knowledge of writing two-column proofs and to problem solving.

Complete Course Outline:

I. Common Sense and Organized Knowledge

A. Geometry, Abstraction, and Logic

1. The nature of Geometry

2. An organized logical development of Geometry

II. Sets and Real numbers

A. Sets and One-to-one correspondences

1. Sets

2. Intersections, Unions, and one-to-one correspondences

B. Real numbers, inequalities, and absolute value

1. The real numbers

2. Inequalities and absolute value

III. Distance

A. Initial Postulates

1. Postulates

B. Using Distances Concepts

1. Betweeness

2. Segments, Rays, and Midpoints

IV. Line, Planes, and Separation

A. Lines and Planes

1. Lines and Planes in Space

2. Sets determining a plane

B. Some language conventions

1. Various ways of saying the same thing

C. Convexity and Separation

1. Convex sets and separation

2. More about separation

V. Angles and Triangles

A. Introducing Angles and Triangles

1. Angles

2. Triangles

B. Measurement and Congruences of angles

1. Measurement of angles

2. Right angles , and perpendicularity

3. Congruence of angles

VI. Congruence

A. Extending Congruence to triangles

1. Congruence of segments and angles

2. Congruence of other sets of points

B. Proving Triangles Congruent

1. The basic congruence postulate for triangles

2. Discovering your own proofs

3. Overlapping triangles

C. Important congruence theorems

1. The angle-side-angle and side-side-side theorems

2. The isosceles triangle theorem

3. The angle bisector theorem

VII. Closer Look at Proof

A. Deductive systems and indirect proof

1. Geometry as a deductive system

2. Indirect Proof

3. Existence and Uniqueness

B. Perpendicularity

1. Theorems about perpendiculars

2. More theorems about perpendiculars

C. Using auxiliary sets

1. Introducing Auxiliary sets in proofs

2. The angle-side-angle theorem and the side-side-side theorem

VIII. Geometric Inequalities

A. Fundamental Inequality Theorem

1. Making reasonable conjectures

2. The exterior angle theorem

3. Two congruence theorems

B. Other inequalities for one triangle

1. Inequalities concerning one triangle

2. Converses of "If., then" statements

3. The triangle inequality, the perpendicular distance theorem, and altitude

C. Inequalities for two triangles

1. The Hinge-Theorem

IX. Perpendicular Lines and Planes in Space

A. Definitions and Basic Theorem

1. The basic definitions

2. The basic Theorem on perpendiculars

B. Other Fundamental Theorems

1. Two existence Theorems

2. Two uniqueness Theorems

C. Additional Theorems on Perpendicularity

1. Other Theorems concerning perpendiculars

2. A summary of relationships

X. Parallel Lines in a Plane

A. Introducing the Parallel Postulates

1. The idea of parallelism

2. Transversals, Alternate Interior Angles, and corresponding Angles

3. The Parallel Postulates

B. Relating Parallelism to Triangles and Quadrilaterals

1. Triangles

2. Quadrilaterals

3. More about Quadrilaterals and Triangles

C. Other uses of Parallelism

1. Rhombus, Rectangle, and Square

2. Transversals to several Parallel lines

XI. Areas of Polygonal Regions

A. The function Concept

1. Functions

B. Polygonal Regions and the Area Postulates

1. Areas of Triangular Regions

2. Areas of Polygonal Regions

C. Special Triangle Relationships

1. The Pythagorean Theorem and its Converse

2. Two special right Triangles

XII. Similarity

A. Sequence and Properties

1. Sequences

2. Proportionality

B. Triangle Similarity Relations

1. Similarity between Triangles

2. The basic proportionality theorem and its converse

3. The Angle-Angle-Angle Similarity Theorem and its Corollaries

4. Two important similarity Theorems

5. Similarities between Right Triangles

C. Areas and Transversals

1. Areas of similar triangular regions

2. Transversals and Proportions

XIII. Circles and Spheres

A. Initial Definition and Theorems

1. Basic definitions

2. The line-Circle Theorems

3. Theorems about Chords and Tangents

4. The Plane-Sphere Theorems

B. Arcs and Inscribed Angles

1. Arcs of Circles

2. Intercepted Arcs and Inscribed Angles

3. Congruent circles and congruent arcs

C. Further Properties of Circles

1. Theorems about two circles

2

2. Equation of circle

XIV. Concurrency and Constructions

A. Concurrency

1. Concurrency Theorems

2. Concurrency of Medians and Angles-Bisector

B. Constructions

1. Constructions with Straightedge and Compass

2. Constructions of Perpendiculars and Parallels

3. More Constructions and some special circles

XV. Measures Relating to Circles

A. Polygons and Circles

1. Polygons

2. Regular Polygons and Circles

B. Circumference, Area, and Arc Length

1. The circumference of a circle and the number π

2. Area of a circular Region

3. Lengths of Arcs and Areas of Sectors

XVI. Volumes and Solids

A. Solids Bounded by Planes

1. Prisms

2. Pyramids

3. Volumes of Prisms and Pyramids, Cavalieri's Principle

B. Solids bounded by other Surfaces

1. Cylinders and Cones

2. Volume of Spherical region

3. Surface Areas of Spheres, and Right Circular Cylinders

Course Title: Applied Geometry A and Applied Geometry B

Text: Geometry - An Informal Approach, Vol. I - V

Authors: Cox and Coxford

Credit: 1/2 Credit per Semester

Usual Grade Level: 11th

Approximate Number of tests and/or Quizzes: 10 per semester

Term Paper Required: No

Final Exam: 10 - 20% of final grade, at discretion of teacher

Special Projects: At discretion of teacher (may include construction notebook)

Pre-Requisites: Successful completion of Introductory Algebra I and Introductory Algebra 2 (or equivalent wit recommendation of counselor or math teacher).

General Course Objectives: Student should be able to:

A. Understand and appreciate basic geometric concepts as encountered in everyday life.

B. Become acquainted with the historical development of geometric concepts and their applications in the modern world.

C. Become acquainted with logical thinking and its application to problem-solving.

D. Appreciate mathematics as an inderlying structure or model for many real-world situations and problems.

E. Become prepared for further study of advanced algebra and trigonometry.

Specific Course Objectives: Student should be able to:

A. Demonstrate an understanding of lines, segments and rays as geometric figures.

B. Demonstrate an understanding of the difference between plane and solid figures.

C. Demonstrate an ability to construct angles and measure angles.

D. Demonstrate an understanding of perpendicularity.

E. Demonstrate an understanding of parallelism (of lines and of planes) and demonstrate an understanding using a transversal line of the method used to determine parallel lines.

F. Demonstrate the ability to find the perimeter of any plane figure.

G. Demonstrate the ability to find the area of regular and irregular polygons.

H. Demonstrate the ability to find the volume of selected space figures.

I. Demonstrate an understanding of congruence of plane and solid figures.

J. Demonstrate the ability to work with similar (or proportional) figures.

K. Demonstrate the ability to perform basic geometric constructions using only a compass and straightedge.

L. Demonstrate an understanding of the Pythagorean Theorem.

M. Demonstrate an understanding of the coordinate system to map points.

N. Demonstrate the ability to construct circles.

O. Demonstrate the ability to compute the area and circumference of circles.

Course Outline:

A. Points, Lines and Planes. Student should be able to:

1. Draw and label the representation of a line, segment, ray or plane.

2. Locate and label the midpoint and bisectors of a segment.

3. Determine the intersection of two lines, a point with a line and two planes.

4. Recognize when parallel and/or perpendicular conditions exist.

5. Understand the concepts of collinear points and coplanar points.

6. Recognize horizontal and vertical lines and/or planes.

7. Understand the relationship of two angles which form a linear pair.

B. Polygons and Three-Space Figures. Student should be able to:

1. Identify, draw and name polygons (n-gons).

2. Identify parts of a polygon such as vertices, sides, diagonals.

3. Classify the quadrilaterals (including the trapezoid, parallelogram, rectangle, square and rhombus) according to:

   a. opposite sides congruent

   b. all sides congruent

   c. opposite angles congruent

   d. all angles right angles

   e. diagonals bisect each other

   f. diagonals congruent

   g. diagonals perpendicular

   h. adjacent angles supplementary

4. Recognize and be able to draw the representation of a 3-space figure.

5. Recognize polyhedrons, regular polyhedrons and prisms.

6. Demonstrate an understanding of Euler's formula by counting the number of sides, vertices and faces of assorted polyhedrons.

C. Triangles. Student should be able to:

1. Classify a triangle by its sides (scalene, isosceles, equilateral).

2. Classify a triangle by its angles (acute, right, obtuse).

3. Name the legs, vertex angle and base angles of an isosceles triangle.

4. Draw and define the altitude, angle bisector, median and/or perpendicular bisector of a side of a triangle.

5. Solve problems using the fact that the sum of the measures of the interior angles of a triangle is 180^{o}.

6. Recognize that each angle of an equilateral triangle measures 60^{o}.

7. Understand that the acute angles of a right triangle are complementary.

8. Understand the relationship of the exterior angle of a triangle to the sum of the measures of the remote interior angles.

D. Angles. Student should be able to:

1. Draw and label angles and angle parts.

2. Understand the meaning of the word "degree" as relating to angle measures.

3. Measure angles with a protractor.

4. Draw an angle of a given measure using a protractor.

5. Measure central angles and/or arcs by means of the "amount of turn".

6. Convert angle measure from degrees to amount of turn or from amount of turn to degrees.

7. Recognize special angles and special angle relationships such as right, acute, obtuse, straight, complementary, supplementary and vertical.

8. Use a compass bearing to locate a point.

E. Parallel Lines. Student should be able to:

1. Define transversal, alternate interior angles, corresponding angles.

2. Understand the relationship of congruent corresponding angles and parallel lines.

3. Understand the relationship of congruent alternate interior angles and parallel lines.

4. Understand the properties of a parallelogram (See B3 above).

F. Circles. Student should be able to:

1. Draw and label circles and circle parts.

2. Draw and recognize inscribed and central angles.

3. Understand and use the special relationship between arc measurement, central angle measurement and inscribed angle measurement.

4. Draw a line tangent to a circle.

G. Measurement and Congruence. Student should be able to:

1. Measure height and width using metric and/or English measuring instrument.

2. Measure angle with protractor.

3. Read a compass bearing.

4. Read celsius and/or fahrenheit thermometer.

5. Recognize congruent figures.

6. Draw or fold lines of symmetry for any given figure.

7. Name pairs of corresponding angles and corresponding sides for a pair of congruent figures.

8. Find perimeter of any polygonal or circular region.

9. Find area of any polygonal or circular region using formulas and/or procedures.

10. Find surface area of any three-dimensional object with polygonal sides or of a cylinder.

11. Use formulas and procedures for finding volume of right prisms or cylinder.

12. Use formulas and procedures to find volume of pyramid or cone.

13. Convert from one unit of volume to its equivalent in another unit:

    a. yards to feet

    b. liters to milliliters, etc.

H. Constructions with Compass and Straightedge. Student should be able to:

1. Construct sement of a specific English or metric measurement.

2. Construct midpoint of a segment.

3. Construct perpendicular bisector of a segment.

4. Construct the bisector of an angle.

5. Copy a given angle.

6. Construct a triangle, given 3 sides.

7. Construct a perpendicular from a point to a line.

8. Construct a perpendicular to a point to a line.

9. Construct a circle circumscribed about a triangle.

10. Construct a circle through 3 non-collinear points.

11. Construct a circle which contains a given arc.

12. Construct a circle inscribed in a triangle.

13. Construct the altitude of a triangle.

14. Construct the median of a triangle.

15. Construct a regular hexagon.

16. Construct a regular octagon.

17. Construct a line parallel to a given line through a point.

I. Similarity. Student should be able to:

1. Solve problems involving sides and/or angle measures of similar polygons.

2. Write and solve proportion problems.

3. Understand the relationship between lengths, areas volumes of similar figures.

4. Make a scale drawing.

J. Pythagorean Theorem and Trigonometric Ratios. Student should be able to:

1. Determine square root of an integer using square root tables.

2. Simplify a radical expression.

3. Use the Pythagorean Theorem to find the length of the side of a right triangle if the lengths of two other sides are known.

4. Use the Pythagorean Theorem to determine if three given lengths are the sides of a right triangle.

5. Use the special relationships of 30-60-90 triangles and/or 45-45-90 triangles to solve problems.

6. Use sine, cosine and tangent ratios to solve problems involving right triangles.

K. Maps and Plane Coordinate Geometry. Students should be able to:

1. Use and interpret information obtained from a road map.

2. Understand the characteristics of a coordinate system.

3. Use ordered pairs of numbers to locate points on a plane.

4. Add, subtract, multiply and divide integers.

5. Draw the graph of a line when given its equation.

Course Title: Algebra IIA and Algebra IIB

Text: Modern Algebra and Trigonometry Structure and Method (Book II)-Revised Edition

Authors: Dolciani, Berman, Wooton

Credit: ½ credit per semester Usual Grade Level: 11th

Approximate number of tests and/or quizzes: 10 per semester

Term paper required: No

Final Exam: 10-20% of final grade, at discretion of teacher

Special Projects: At the discretion of the teacher

Pre-Requisites:

Rationale:

Algebra II is designed to review the basis concepts of the real number system and to investigate the properties of that system. The number system is extended to include the complex numbers, and basic trigonometry is introduced.

The concepts as required in this course should form the basis for advanced courses the student will encounter in subsequent mathematics endeavors.

Description of students for which the course is planned in general:

This course is designed to prepare the student for advanced courses in mathematics. The course moves rapidly and students taking this course should have an aptitude and an interest in mathematics. Many of the topics covered could have a direct application in the sciences and students interested in that field would profit from taking this course.

Most frequent methods of instruction generally used in this course:

Lecture, discussion, problem solving, and introduction of models to illustrate concepts when applicable. Students are guided in discovering mathematical principles and are given the opportunity to strengthen the comprehensive study of these principles by the variety of exercises available.

Course Evaluation:

The effectiveness of this course will be measured as follows:

1. 70% of the students who finish the course should meet the course objectives to the teacher's satisfaction.

2. The teachers will use their own tests and personal observations of their students as the evaluation.

Objectives of the Course:

I. Content and Knowledge Skills

1. Understand idea of sets and their relationships.

2. Recognize properties of the real numbers.

3. Being able to use axioms in proof concept.

4. Being able to solve open sentences in one variable.

5. Being able to graph simple linear equations and inequalities.

6. Being able to solve systems of linear equations in two variables.

7. Being able to factor polynomial expressions.

8. Being able to use factoring of polynomials to solve equations.

9. Have a basic understanding of relations and functions.

10. Being able to solve quadratic equations.

11. Being able to graph quadratic functions and relations such as the parabola, ellipse, circle and hyperbola.

12. Being able to perform arithmetic operations with rational and irrational numbers.

13. Being able to solve simple radical equations.

14. Being able to perform arithmetic operations using fractional and negative exponents.

15. To have an understanding of common logarithms.

16. Being able to perform simple operations using complex numbers.

17. Being able to determine the values of trigonometric functions.

18. Being able to graph equations and inequalities in two variables.

II. Application Skills

1. Being able to apply the skills obtained with fractional, decimal and negative exponents, and logarithms to future science courses such as chemistry and physics.

2. To be an aid in interpreting and understanding mathematical data which the student may encounter in advanced math courses or in such diverse fields as health, economics, psychology or politics.

3. As an aid in solving word problems.

III. Application Skills

Being able to apply the skills learned in this course to problem solving.

Complete Course Outline:

I. Sets of Numbers; Axioms

A. Sets

1. Terminology

2. Symbols

B. Axioms for Real Numbers.

1. Properties

2. The Concept of Proof

II. Open Sentences in One Variable

A. Equivalent Expressions

1. Review of terms for algebraic expressions

2. Simplifying and solving open sentences

3. Simplifying and solving inequalities

4. Combining open sentences

B. Using Variables to Solve Problems

1. Writing equations for word problems

2. Solving simple word problems.

III. Systems of Linear Open Sentences

A. Linear Equations

1. Finding points on a given line

2. Determining equations of a line

B. Lines

1. Slope

2. Determining equations of a line

3. Solving systems of two linear equations

4. Linear inequalities

IV. Polynomials and Factoring

A. Products of Polynomials

1. Laws of Exponents

2. Miltiplying Polynomial

B. Factoring

1. Factoring numbers

2. Factoring polynomials

C. Factoring in Open Sentences

1. Factoring to Solve equations

2. Factoring to solve inequalities

D. Dividing polynomials

V. Rational Numbers and Expressions

A. Zero and Negative Exponents

B. Algebraic Fractions

1. Reducing Algebraic Fractions

2. Multiplying and dividing algebraic fractions

3. Adding and sultracting algebraic fractions

4. Complex fractions

C. Fractional Problems

1. Polynomials with rational coefficients

2. Fractions in word problems

3. Fractional equations

D. Decimals and Scientific notation

1. Interchanging decimals with fractions

2. Approximations

3. Scientific notation

VI. Relations and Functions

A. Specifying relations and functions

1. Relations

2. Functions

B. Linear Functions and Relations

1. Linear Functions and Direct Variation

2. Special Functions and Relations (Optional)

C. Quadratic Functions and Relations

1. Quadratic Functions and Variations

2. Quadratic Functions - Parabolas

3. Graphing quadratic inequalities - Parabolas (Optional)

VII. Irrational Numbers and Quadratic Equations

A. Real Roots of Real Numbers

1. Using radicals to express roots

2. Rational and Irrational Roots

3. Rational Operations

4. Decimals for real numbers

B. Working with Radicals

1. Properties of Radicals

2. Simplifying Sums of Radicals

3. Products of Sums containing radicals

C. Radicals in Equations

1. Using radicals to solve quadratic equations

2. Roots and coefficients of a quadratic equation

3. Nature of roots of a quadratic equation

4. Solving quadratic inequalities

5. Irrational equations

VIII. Quadratic Relations and Systems

A. Coordinates and Distances in a Plane

1. Distance between points
2. Perpendicular Lines (Optional)

B. Graphing Quadratic Relations

1. Circles
2. Parabolas
3. Ellipses
4. Hyperbolas
5. Inverse variation

C. Solving Quadratic Systems

1. Graphic Solutions
2. Linear-Quadratic Systems
3. Quadratic-Quadratic Systems

IX. Exponential Function and Logarithms

A. From Exponents to Logarithms

1. Rational Numbers as exponents
2. Real Numbers as exponents
3. Relations and their inverses
4. Exponential and logarithmic functions

B. Using Logarithms

1. Common logarithms
2. Interpolation
3. Products and quotients
4. Powers and roots
5. Combined operations

6. Using logarithms to solve equations

X. Trigonometric Functions and Complex Numbers

A. Coordinates and Trigonometry

1. Sine and Cosine functions

2. Trigonometric functions

3. Special angles

B. Evaluating Trigonometric Functions

1. Using tables

2. Logarithms of the values of trigonometric functions (Optional)

3. Reference angles

4. Vectors (Optional)

C. Complex Numbers

1. Complex numbers defined

2. Multiplying pure imaginary numbers

3. Complex numbers and quadratic equations

XI. Trigonometric Identities and Formulas (Optional)

A. Identities Involving One Angle

1. Fundamental identities

2. Proving identities

B. Identities Involving Two Angles

C. Triangle Applications

1. Law of cosines

2. Law of sines

3. Solving triangles

4. Areas of triangles

Course Title: Introductory Algebra III A and Introductory Algebra III B

Text: (To be selected by Mathematics Department at West Bloomfield High School)

Credit: 1/2 credit per semester

Usual Grade Level: 11th

Approximate number of tests and/or quizzes per semester: 10

Term paper required: No Special Projects: At discretion of teacher

Final Exam: 10-20% of final grade, at discretion of teacher

Pre-Requisites: Introductory Algebra II and Applied Geometry or Algebra I and Plane Geometry

Rationale:

This second-level course in algebra is designed for students who have completed the Introductory Algebra II and Applied Geometry in order to help these students assimilate and enlarge their understanding of the real number system and its properties. The number system will be extended to include the complex numbers and basic work with exponents and logarithms will be introduced. Topics covered will be as nearly identical to the Algebra II course offered as possible; differences in the two courses will occur in the depth to which the subject matter is pursued in the various topics encountered.

Description of students for whom the course is planned:

Students who would find the demands of the traditional one-year Algebra I and one-year Algebra II course too rigorous would benefit most from this course provided they have successfully completed Introductory Algebra I, Introductory Algebra II and Applied Geometry. It is also possible that students who encountered severe learning problems in the mastery of the traditional one-year Algebra I and one-year Plane Geometry course might wish to be included in the group who would elect this course of study.

Course Evaluation:

If 70% of the students who take this course meet the course objectives to the satisfaction of the instructor, the effectiveness will have been established. Teachers will use their own tests as well as their personal observations of their students in this evaluation.

Complete Course Outline:

I. Fundamental Algebraic Operations

- A. Number Line - real; positive and negative numbers
- B. Operations with monomials and polynomials
- C. Graphing
- D. Powers of numbers
- E. Factoring (various prototypes)
- F. Sums, differences, products, quotions of algebraic expressions
- G. LCM; GCF; Fractions
  1. Fundamental operations with fractions
  2. Mixed operations with fractions
  3. Complex fractions

II. First Degree Equations in One Unknown

- A. Definition of equation
  1. Root of equation
  2. Solving an equation
- B. Fractional equations
- C. Evaluating formulas
- D. Word problems utilizing first degree equations
- E. Solving simultaneous equations

III. Quadratic Equations

- A. Definition and characteristics of the quadratic equation
  1. Solving quadratic equation
     a. Quadratic formula
     b. Completing the square
     c. Graphing
  2. Determining the nature of the root of a quadratic (real or imaginary)

3. Graphing quadratic equations

   a. Parabola

   b. Circle

   c. Ellipse

   d. Hyperbola

   e. Intersecting lines

4. Simultaneous solution of quadratic equations

   a. Algebraic

   b. Graphic

5. Systems of equations with quadratics

IV. Exponents and Radicals

   A. Irrational equations

   B. Logarithms and using logarithmic tables

V. Imaginary Numbers

VI. Functions

   A. Linear

   B. Quadratic

   C. Recognition of difference in graphs of 1st and 2nd degree functions

VII. Binomial Theorem

   A. $(A + B)^n$

   B. $(A + B)^{1/n}$

   C. $(A + B)^{-n}$

VIII. Determinants

IX. Progressions

   A. Arithmetic

   B. Geometric

X. Introduction to Trigonometry

   A. Trigonometric Functions: sine, cosine, tangent, cotangent, secant, cosecant

B. Using trigonometric function tables

C. Solving right triangles

D. Basic identities

Course Title: Plane Trigonometry A

Text: Modern Introductory Analysis

Authors: Dolciani, Beckenbach, Donnelly, Jurgensen & Wooten (Houghton Miflin Company)

Credit: 1/2 credit

Usual Grade Level: 12th

Approximate number of tests and/or quizzes per semester: 10

Term paper required: No Special Projects: At discretion of teacher

Final Exam: 10-20% of final grade, at discretion of teacher

Pre-Requisites: Successful completion of Algebra II or successful completion of Introductory Algebra III

Rationale:

This course provides a preparation for college courses in calculus, linear algebra, probability, etc. and may also serve as a terminal course for students completing their study of mathematics. The title of the course will enable institutions who require "Plane Trigonometry" as an entrance requirement to identify students from West Bloomfield High School who have successfully completed this course from the transcript of grades. The course will stress practical as well as abstract treatment of logarithms, circular functions, trigonometric functions, solving right triangles, trigonometric identities, special Pythagorean triangles, reduction formulas and inverse trigonometric functions; plus other selected topics as indicated in the course outline.

Description of students for whom the course is planned:

This course is designed for capable students who have an aptitude and interest in mathematics and who are capable of progressing at a fairly rapid pace. Students are expected to possess a working knowledge of, at least, elementary and intermediate algebra and geometry.

Course Evaluation:

If 70% of the students who take this course meet the course objectives to the satisfaction of the instructor, the effectiveness will have been established. Teachers will use their own tests as well as their personal observations of their students in this evaluation.

Complete Course Outline:

I. Trigonometric Functions of an Acute Angle

A. Sine, cosine, tangent and their co-functions

B. Special angles - 30°, 45°, 60° and solving right triangles

C. Utilization of tables of trigonometric functions

D. Practical application of trigonometric functions

1. Finding heights and distances, using trigonometric functions

E. Solving rectilinear figures

II. Fundamental Relations Among the Trigonometric Functions

A. Recognition of the fundamental identities and definitions

B. Recognition of the Pythagorean identities

C. Verification of identities

D. Determining lengths of segments from more complex triangle figure

III. Angles

A. Definition of angle

B. Utilization of rectilinear coordinate system to identify standard trigonometric form

C. Special angle location of 0°, 30°, 45°, 60°, 90°, 120°, 135°, 150°, 180° relating to symmetric points on unit circle

D. Expressing a trigonometric function of <u>any</u> angle as a function of an acute angle

E. Arithmetic sign of function (positive or negative) of any angle

IV. The Right Triangle

A. Mastery of usage of trigonometric tables and interpolation

B. Importance of sketch in determining trigonometric solutions

1. Angles of depression

2. Angles of elevation

C. Incorporation of logarithms as an aid to solving problems

D. Practical problems using previously-listed concepts from this section

V. Radian Measure

A. Definition of radian

1. Notation identification

2. Comparison of radians with degrees

3. Functions of $90^{\circ} \pm \theta$; $270^{\circ} \pm \theta$

4. Functions of $180^{\circ} \pm \theta$; $-\theta$

VI. Vectors

VII. Graphs of Trigonometric Functions

A. y = sine x

B. y = cosine x

C. y = tangent x

D. Graphs of the inverses of sine, cosine and tangent

VIII. General Formulas

A. Sum and Difference formulas for sine and cosine

B. Sum and Difference formulas for tangent

C. Double-Angle formulas

D. Half-Angle formulas

E. Conversion formulas

F. Law of Sines

G. Law of Cosines

H. Law of Tangents

IX. Oblique Triangles - Four Cases

X. Inverse Trigonometric Functions

XI. Complex Numbers

XII. Logarithms

A. Definition

1. Characteristic

2. Mantissa

B. Laws of logarithms

C. Computations using log tables

1. Base e

2. Base 10

3. Interpolation

D. Antilogarithms

Logarithms and arithmetic signs

Course Title: Special Topics in Algebra B

Text: Modern Introductory Analysis

Authors: Dolciani, Beckenbach, Donnelly, Jurgensen & Wooton (Houghton Miflin Company)

Credit: 1/2 credit

Usual Grade Level: 12th

Approximate number of tests and/or quizzes per semester: 10

Term paper required: No Special Projects: At discretion of teacher

Final Exam: 10-20% of final grade, at discretion of teacher

Pre-Requisites: Successful completion of Algebra II or successful completion of Introductory Algebra III

Rationale:

This course will provide a preparation for college courses in calculus, abstract algebra, linear algebra,computer programming and/or probability. It may also serve as a terminal course for students completing their study of mathematics. Primary concern will be the re-examination of our number systems and the study of functions. Students will be encouraged to comprehend algorithmic concepts and refine the skills used in the algebra, two-and-three-space vectors, complex numbers and polynomial expressions. Students will study in detail the binomial theorem and the evaluation of factorial expressions. Pascal's triangle will be utilized as an aid in effecting the expansion of a binomial. Students will be introduced to analytic geometry, arithmetic and geometric progressions and the use of the first and second derivaties in graphing polynomial expressions. Determinants and Cramer's Law will be studied and matrix algebra will be introduced.

Description of students for whom the course is planned:

This course is designed for capable students who have an aptitude and interest in mathematics and who are capable of progressing at a fairly rapid pace. Students are expected to possess a working knowledge of, at least, elementary and intermediate algebra and geometry.

Course Evaluation:

If 70% of the students who take this course meet the course objectives to the satisfaction of the instructor, the effectiveness will have been established. Teachers will use their own tests as well as their personal observations of their students in this evaluation.

Complete Course Outline:

I. Sequences and Series - Mathematical Induction

- A. Principle of mathematical Induction
- B. Arithmetic progressions
- C. Geometric progressions
- D. Binomial theorem and Pascal's Triangle
- E. Limit of sequences
- F. Laws of integral exponents proved by mathematical induction

II. Algebra of Vectors

- A. Ordered pairs as vectors
- B. Vector addition and subtraction
- C. Norm of a vector
- D. Scalar multiplication and parallel vectors
- E. Inner product and perpendicular vectors

III. Vectors, Points and Lines

- A. Distance between two points
- B. Vector equation of line
- C. Parallel and coincident lines
- D. Length of line segment
- E. Distance between point and line
- F. Intersection of lines
  - 1. Cramer's Law
  - 2. Matrix Algebra
  - 3. Determinant
- G. Relationship of direction vector to slope of line

IV. Complex Numbers

A. Factoring polynomials

B. Addition and subtraction of complex numbers

C. Multiplication of complex numbers

D. Quadratic formula extended to include complex solutions to second degree equations

V. Graphs of Polynomial Functions of 3rd Degree and Higher

A. Plotting points

B. Continuity of functions

C. Synthetic division

D. Derivative of continuous polynomial function

E. Graphing polynomial function using first and second derivative

F. Story problems concerning maximum and minimum points

1. Use 1st derivative to solve story problems of this type

Course Title: Business Mathematics A and Business Mathematics B

Credit: ½ credit per semester

Text: Applied Business Mathematics, Fairbank, Schultheis, Piper, Tenth Edition, 1975.

Approximate number of tests and/or quizzes per semester: 6-8

Usual grade level: 10th or 11th Term paper required: No

Final Exam: 10-20% of final grade at discretion of teacher

Pre-Requisites:

Rationale:

This course is designed to help students apply math skills to their own daily life and to business operations. It should help the student understand the importance of using practical math applications to figure own expenses.

Course Evaluation:

1. 70% of the students who take the course must meet the teacher's objectives.
2. The students will be evaluated from the teacher's tests.

Types of Objectives:

I. Content and Knowledge Skills: The student shall:

1. Be able to perform problems involving fundamental arthmetic operations.
2. Understand the importance of keeping sales receipts.

3. Be able to compute whole and fractional unit prices.

4. Be able to compute taxes: sales, property and income.

5. Understand the order of numbers on the number line.

6. Be able to derive simple ratios and proportions.

7. Be able to calculate wage income and wage deduction.

8. Be able to change common fractions to decimals and decimals to fractions.

9. Be able to change percents to decimals and fractions and vice versa.

10. Be able to compute commissions - straight and graduated.

11. Be able to compute interest on savings, loans, mortgages and installments.

12. Be able to compute payments for investment procedures-bonds, stock, insurance and real estate.

13. Be able to figure home ownership costs.

14. Be able to interpret or understand home maintenance bills.

15. Be able to compute automobile transportation expenses.

16. Be able to compute gross profit, net profit and operating expenses for small businesses.

17. Be able to compute simple retail buying problems.

18. Be able to compute simple cash discounts.

II. Application Skills

1. Be able to apply their arithmetic skill in keeping personal money records.

2. Be able to write checks properly.

3. Be able to check own wages and deductions for accuracy.

4. Be able to apply arithmetic skills in figuring investments, budgets, home, travel, transportation, etc.

III. Skills and Synthesis

Being able to apply the skills learned in this course to every day life.

Complete Outline:

I. Personal Money Records

A. Keeping personal cash records

B. Checkbook: Records and balances

II. Buying Problems

A. Sales slips

B. Sales tax

C. Aliquot parts

D. Unit prices

E. Average prices

III. Special Buying Problems

A. Buying fractions of a unit

B. Purchases involving mixed numbers

C. Figuring unit prices

IV. Wages

A. Figuring wage incomes

B. Deductions from wages

C. Special wage problems

D. Personal budget problems

V. Commissions

A. Figuring commissions

B. Graduated commissions

C. Commission rates

D. Agent's commissions

VI. Borrowing Money

A. Borrowing money on a note

B. Borrowing from a bank

C. Borrowing on collateral

D. Credit Unions and Finance Companies

E. Borrowing from other agencies

F. Installment buying

VII. Saving and Investing

A. Savings accounts

B. Buying life insurance

C. Investing in bonds

D. Investing in stock

E. Investing in real estate

VIII. Home Expenses

A. Owning a home

B. Taxes on the home

C. Insuring the home

D. Checking Electric, Gas, Water and Telephone bills

IX. Transportation

A. Owning and insuring the automobile

B. Figuring travel expenses

X. Taxes

A. Property taxes

B. Sales and Excise tax

C. Social Security

XI. The Small Business

A. The balance sheet

B. The income statement

C. Figuring payrolls

XII. The Retailer: Buying

A. Purchasing merchandise

B. Figuring trade discounts

C. Figuring cash discounts

D. Figuring buying expense

XIII. The Retailer: Selling

A. Sales records

B. Figuring retail discounts

C. Figuring profits on sales

D. Pricing goods - sales price basis

E. Pricing goods - cost price basis

XIV. The Wholesaler

A. Sales invoice

B. Promissory notes and bank discounts

C. Bankruptcy of a customer

D. The commission merchant

XV. The Manufacturer

A. Figuring cost of manufacturing

B. Pricing manufactures articles

XVI. Special Business and Farm Problems - Optional

A. Office costs

B. Distributing partnership income and corporation income

C. Problems of the farmer

XVII. Metric and United States Measurements

A. The United States measurement

B. The Metric System: Length and Distance and Capacity and Weight

XVIII. Computer Mathematics and Probability -- Optional

A. Decimal system of numeration

B. Binary system of numeration and of arithmetic

C. Probability

Course Title: Calculus A and Calculus B

Text: Elements of Calculus and Analytic Geometry

Author: George B. Thomas, Jr. Credit: ½ credit per semester

Usual Grade Level: 12th

Approximate number of tests and/or Quizzes: 8 per semester

Term Paper: No

Final Exam: 10-20% of final grade at discretion of teacher

Special Projects: At discretion of teacher

Pre-Requisites:

Rationale:

This course is designed to introduce the high school student to the calculus, both differential and integral. The topics covered meet the requirements set forth by the College Entrance Examination Board for the B Examination.

Description of students for which the course is planned:

Students taking this class should have four years of mathematics in their background, (Alg I, Alg II, Geometry, Analysis). Having started with Alg I at the Middle School.

Most frequent methods of instruction generally used in this course:

Lecture, discussion, and problem solving. An emphasis will be placed on problem solving, since many of the subtleties of the subject are learned by doing the problems.

Course Evaluation:

The effectiveness of this course will be measured as follows:

1. 70% of the students who finish the course should meet the course objectives to the teacher's satisfaction.

2. The teachers will use their own tests and personal observations of the students as the evaluation.

Objectives of the Course:

I. Content and Knowledge Skills

1. Understand Basic Algebra Skills

   A. Equations of line

   B. Slope of line

   C. Absolute value

   D. Functions

2. Be able to understand idea of limits

3. Be able to take derivatives of Algebraic funtions by various methods

4. Be able to integrate various functions

5. Be able to take derivatives of Transcendental Functions

6. Be able to Integrate Transcendental Functions

7. Know equation basic to Analytical Geometry

   A. Circles

   B. Parabola

   C. Hyperbola

   D. Ellipse

II. Application Skills

1. Use the derivative of functions in the application to Problem - Solving, such as:

   A. Max - Min.

   B. Related Rates

   C. Curve Plotting

2. Use the integral of functions in the application to Problem Solving, such as:

   A. Area under curve

   B. Area between curves

   C. Volumes

   D. Length of Plane Curve

Complete Course Outline:

I. Basic Algebra Skills

   A. Slope

   B. Increments

   C. Absolute values

   D. Equations of straight line

   E. Intervals and Neighborhoods

II. Functions

   A. Definition

   B. Combining Functions

   C. Slope of a curve

   D. Derivatives of a function

   E. Velocity and Rates

VII. Applications of the Definite Integral

- A. Area Between Curves
- B. Distance
- C. Volumes
- D. Area of Surface of Revolution
- E. Average Value of a Function

VIII. Transcendental Functions

- A. The Trigonometry Functions
- B. Derivatives of Inverse Functions
- C. The Natural Logarithm
- D. The Derivative of lnx
- E. Properties of Natural Logarithms

IX. Methods of Integration

- A. Basic Formulas
- B. Even Powers of Sines and Cosines
- C. Integration by Parts
- D. Integration by Partial Fractions

X. Plane Analytic Geometry

- A. Curves and Equations
- B. Tangents and Normals
- C. The circle
- D. The Parabola
- E. The Ellipse
- F. The Hyperbola